THE GENESIS OF A COMPREHENSIVE DESIGN THINKING SOLUTION

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ABSTRACT

In this paper we address principles of the design thinking methodology and their value to design projects. We do this by describing the challenge, progress and results of a use case project for a major retail group. Specific emphasis is put on the user-centered approach, defined methods of innovation and on low-fidelity prototypes, as the retail group's innovation department insufficiently applied those in their prior attempts to address the challenge. The focus of the paper is on the teams performance to innovate by applying design principles to a grazed over context.

Keywords: design thinking, online shopping, personal supply chain, e-grocery, virtual shopping, pick-up station, smart shopper, user-centric design, low-fidelity prototyping, 3D-Grocery, design principles, design as value

1   INTRODUCTION

In this paper we substantiate a design thinking approach towards a complex problem in retail. The project initiator, an international, industry leading retail group, was seeking for a new concept for urban grocery. The inter-disciplinary staffed innovation department of the retail group has years of innovation experience and an above-average R&D budget. Spending month of conceptual work with internal and external experts, they did not reach a solution that seemed promising enough to the group. A strong focus on technical innovation on the one side (something the reputation of the retail group has been very successful with over the last decades) and the managing department's focus on business viability on the other side, were the determining factors during these months.

The challenge and project status were handed over to the School of Design Thinking to gain new perspectives and inspiration for their own innovation process, initially with low expectations. The 4-headed multi-disciplinary project team was, at that time, involved in design thinking projects for 6 months only. In contrast to the either technical or economic approaches taken by the innovation department the team started with the users perspective, here retail customers, with the claim to later harmonize all three perspectives (as depicted in Figure 1).
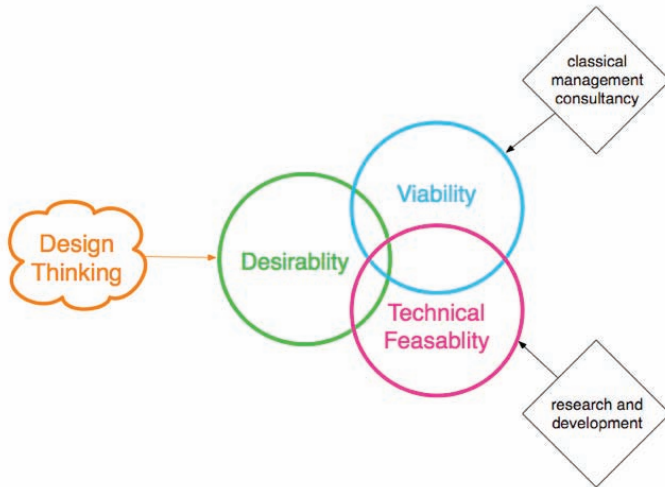
Figure 1. Three approaches to innovation (source: Brown, [7])

The project soon surpassed everybody's expectations and showed impressively, how a small group, with restricted budget and time, without a specific project expertise, can develop innovative concepts for a complex challenge by applying design thinking principles.

In this paper we substantiate that design thinking performs as a methodology for innovation, especially for complex challenges where diverse experts and multi-parted solution is needed to create an overall concept, accepted by the user. Therefore we will present the project work and the solution developed shortly to emphasize the broad approach that has been set in motion by the project team and is now being implemented by the project initiator.

2 DESIGN THINKING APPROACH AND PROJECT COURSE

As mentioned above the project initiator was an international retail group with a worldwide leading reputation for constant innovation and technology-development. Inside the innovation department, there is a huge opportunity for design driven working modes. But instead solutions and projects try to conform to the economic- and technology- focused competencies of the company in order to be accepted as valuable department.

One chance of taking a risk is to try something free of dogma without loosing reputation within the company is to outsource. This is what the innovation department did by approaching the project team with the challenge, to regain grocery customers for their major grocery chain with mega stores mainly located outside city centers, called hypermarkets. The retail group had not set an internal strategy, but the economic need for innovative change was essential. An indistinct understanding of the value of user-centered solutions and the stagnated internal process grounded the decision for the design thinking approach.

2.1 Design Thinking Definition

Before introducing the project itself we want to introduce the understanding of design thinking underlying this paper. Design thinking is a concept, substantiating design principles and applying them through various elements such as an iterative process, user research and feedback, prototyping, creative workspace and many more. The repeated use of these artifacts creates a shared value among team members that allows them to take risks and go beyond habitual limits of work contexts, which enables innovation. This is what students can learn at the School of Design Thinking.

While designing a solution, design thinker put a strong focus on user needs and experiences. Nevertheless technical feasibility and economic viability is considered to be crucial for the success of a solution.

Design thinking is a flexible approach that works only by denying any kind of dogma. The choice of methods and techniques is therefore free, but there are some who support teamwork better then others. One successful technique is, for example, to follow an iterative process.
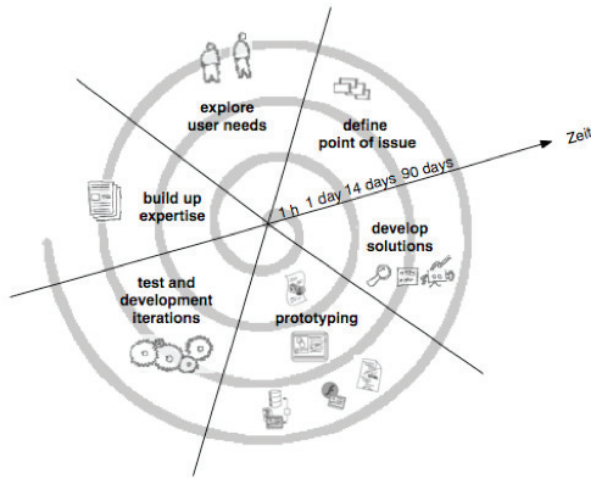

Figure 2. Short, naive process iterations are becoming increasingly longer and sophisticated as the solutions evolve

This allows the team to prototype early on, which is proved to relax team dynamics by bringing in playful elements [20]. Another particular advantage of fast prototyping in multiple iterations allows all parties involved in a project, to understand an idea in terms of its usability, technical feasibility or desirability. Outsiders can understand the concept behind a prototype and a usage experience can be communicated to evaluate it with the projected target group.

Moreover, low-fidelity prototypes make it easier to accept a failure. This way, end-users and partners feel more comfortable to give honest and critical feedback to a concept as for a sophisticated prototype.

Over the course of iterations the prototypes are constantly evolving and become increasingly rich in details. For example typical software prototypes are (in ascending order), a hand-drawn sketch, a physical mock-up, wireframes, html-based prototypes, flash-based prototypes and functional code as depicted in Figure 3.
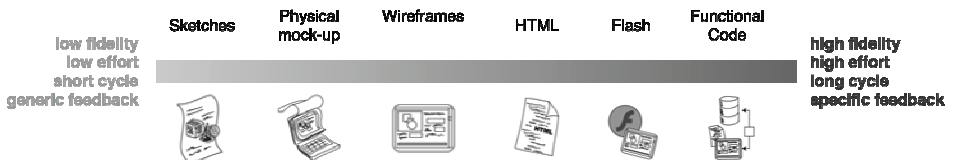

Figure 3. Typical software prototypes in ascending order (source: HPI [12])

Furthermore an iterative process allows the team to get feedback various times over a development period. The advantage is not only to learn about mistakes at early stages but also to grow together as a team by presenting to others (solidarity theory according to Durkheim [18]) and to gain motivation. These phenomena could be clearly absorbed in the presented project.

2.2 A Defined Challenging Question

The first goal of design thinking projects is to define its challenge. It is one of the major principles that before chasing after solutions, one should seek to really understand the design problem.

After a first broad research on grocery shopping needs of several user groups, the project team formulated an overall challenge: How might we enhance personal supply chains for retail customers, regarding convenience, cost effectiveness and sustainability?

As in this example, initial challenges formulated as a question from the user perspective are very valuable. They serve as a benchmark for all adjoining process phases, especially idea generation. Next to the strong user-centeredness of the question, it is important to set a project focus on the one hand and to leave the question broad to enable truly new solution approaches on the other hand.

Over this first research phase, the client had been extraordinarily open minded, giving the team total freedom while supporting them with their expertise when asked to do so. This helped to integrate the project partner into the team, even though they were geographically dispersed. The trust pre-invested in the team later turned out to be a base for an atmosphere that allowed the team to step back and forth in the process, rejecting ideas and prototypes, before developing the final solution without the fear of being put down.

2.3 Target Group

A target group helps teams in design thinking projects to focus on specific conditions knowing that it is almost impossible to design „one-fits-all" solutions. This is mostly described as „designing decisions conditionally", as described in [19].

The decision for a target group was mainly influenced by the project initiator's wish for a completely new trade format for several branches without cannibalizing the traditional store business. Therefore the demand was a target group, which is weakly addressed by the hypermarkets at that time. The project team opted, after gauging pro and contra of different user groups, for "young urban professionals". The target group represents trendsetters. Wining them for a new shopping concept would attract other user groups in succession. Furthermore, young urban professionals are not very price sensitive and will found a family within the next 5-10 years, which makes it especially valuable to win them as customers. The student team did the research on potential target groups. While the project initiator and the team took the decision for young urban professionals together.

For the project, young urban professionals were defined as well-paid young middle-class professionals who have long working days, work and/or live around city center and have a luxurious lifestyle. The research revealed that young urban professionals most commonly shop at small groceries located on their way home and stores with extended opening hours. They are predominantly unmarried and live a conscious and juvenile life. Their private milieu is very important to them, but constantly suffers from a lack of attention, which is, according to their awareness, due to a perpetual shortage of time. Young urban professionals possess of permissive financial resources and emphasise the importance of a lifestyle that reflects this. Grocery shopping is a means to an end for this target group. Of particular importance to them is the quality and freshness of the goods and the overall time needed to do grocery shopping. They linger longer only at those stores, where they feel esteemed and inspired and as a result spend more money.

2.4 User, Needs and Insights

For design thinking projects it is of major importance to gain as well broad as deep knowledge on the projected target group as explained and exemplified above. This supports the ability to emphasise with representatives of the target group and to develop a deep understanding of their habits and evinced or latent needs.

The team spent 3 weeks with observations, employing a diversity of methods like interviews, data-mining, observations, shared experiences and many more. For the research phase the team split up into sub-teams and used storytelling and clustering (storytelling, as used in the project context, is described in [17], p.520ff) as major methods to share experiences with the rest of the team. As well all observations were documented and shared with the project initiator over a wiki, so they could use the insights gained in other contexts for future projects, too. The facts of the grocery shopping experience of young urban professionals were finally synthesised into the following key insights and needs:

- Purchasing trigger: Young urban professionals seek for a sense of achievement. For example, this can be obtained through a good bargain, positive surprises or an unexpected service.
- Information assistance: A significant number of young urban professionals use shopping lists to ensure not to forget any of the items initially wanted. By sticking to the shopping list too closely, the customers narrow their room for inspiration artificially.

- Staff-customer-interaction: Young urban professionals have diverse requirements towards support of the service staff. The challenge is to train the staff in a way, which enables them to recognize the specific need of an individual customer. Through constant contentment, trust might be generated.
- Experience trigger: Shopping is often understood as a medium for social interaction. It offers chances for learning, discovering and exchanging information. Due to the quantity of information and size of the store, the hypermarkets need to take extra care not to over-stimulate their customers.
- Hurdles: Grocery shopping is an everyday activity. It is experienced as very low inspiring and suffers, in its reputation, from the must-do-effect. Furthermore, reorganizing of shelves and departments, restricted access (opening hours, mobility etc.), large packaging and choice are the main hurdles.
- Quality signals: Transparency was detected as the keyword of today's customer demand. The young urban professional, even more than other customer groups, wants to be informed to decide independently what is good according to his individual criteria (such as quality, fairness, sustainability, etc.). Furthermore, an authentic sensual presentation of goods creates positive perceptions.
- Transport: Valued are short and trouble-free ways that enable spontaneous grocery shopping. A smooth integration into the young urban professionals' everyday-life facilitates the planning.

The team put a special focus on delivery services, as today's only alternative to traditional grocery shopping. Shopping via delivery services was analysed from two perspectives: ordering and receiving. Time slots in between these two vary considerably between service providers. The following criteria were identified to be crucial to satisfy the young urban professional:

- Short waiting time in between order and delivery
- Narrowing the delivery window, which requires the presence of the customer at a defined location
- Free choice of the delivery window
- Wide array of goods deliverable
- Low extra costs (delivery fee and/or minimum order)
- Enable high shopping frequencies, spontaneous orders
- Quality of the goods (especially with fresh and cooled goods)
- Cooling chain while transport (consideration of 4 cooling zones)
- Minimization of packaging
- Transparent responsibilities, strengthens trust
- Capture shopping ideas anytime they come to mind

The previous listings prove the deep understanding of the target group and the insights and needs that were derived from it. In contradiction to conventional development methods, it is the user-needs that form the initial motivation for the development of new concepts, rather than technical or economic aspects.

In this second phase of research, project initiator and team were surprised by the quality and quantity of valuable data gained by the user research. This motivated the team and gave it confidence for the next, most analytical and therefore most arduous but crucial step prior to the development of a solution.

2.5 Framework

A framework (as described in [21]) was developed as an analytical model, which contains the challenge and the crucial criteria for potential solutions.

The framework was designed as a two-by-two diagram with the following four characteristics:

- Support fun, experience and inspiration while grocery shopping
- Facilitate relaxation, routine, simplicity and transparency
- Reconsideration of the felt and de facto time needed for grocery shopping
- Support the autonomy of the customer

Two different personas (named Ole and Claudius) representing young urban professionals were created, and their habits and needs were located on the two-by-two diagram. So were the current

offerings of the hypermarkets, delivery services and local convenience stores. Later, the two-by-two diagram served as benchmark for potential solutions regarding insights and needs.

According to [16] (p. 123ff), "Personas are not real people, but they represent them throughout the design process. They are hypothetical archetypes of actual users."

Conterminously to promising concepts the framework is a very important project outcome. It can be used any time later to derive and evaluate the concept developed. In later implementation phases user-centric concepts often shift towards technical and economical considerations. The application of the framework as a mean of evaluation helps not to lose the user focus in those situations.

The creation of the framework is often the most arduous part of the research phase due to a high demand of abstraction and a need to take decisions that will affect the rest of the project significantly. This phase is often called a bottleneck within a design thinking project, where all team members need to pass through, at an agreed point in time. For the student team, which was set up with students from diverse fields, this was the low point of the project, regarding the team spirit. The first approach failed, which was soon realised by the team. Through the experiences of numerous projects, the team was aware of the importance of a reasoned framework and therefore decided to iterate the framework once more, after having started a first round of brainstorming on ideas. Reaching a point of consent on the results, lead to a close up of the team and a push towards consensus and fun. During this phase the student team intuitively isolated from outside influence to keep potential censors away from interventions. Once agreed on a result, they were interrogating feedback from all stakeholders, to specify a common understanding.

2.6 Idea Generation

From the gained insights and aiming to accomplish the requirements of the framework, the team then went on with an ideation phase consisting of brainstorming sessions on specific aspects, supported by intermediate research sessions. Among others, this was the central brainstorming question: "How might we develop an inspiring way of grocery shopping on Ole's way home?" The team developed hundreds of ideas, which were clustered, combined, voted on and discussed with the project initiator, coaches and friends. The energy within the team was on its peak in this phase of the process. Finally, all ideas held back could be discussed; the gained trust within the team allowed the discussion of wild and freaky ideas and the positive moral supported the building on the ideas of others. A choice of ideas was then selected for further elaboration. All ideas were never the less sent to the project initiator who discussed the ideas intensely with the student team and in their own business context, but did not intervene on the students choice of ideas to go on with.

2.7 Prototype Implementation and Testing

For three selected ideas (some of them combinations of several ideas) to pursue with, the team then did extensive research on technologies, economics and usability aspects. Therefore, the student team had a close look on the project initiators competencies, research and strategies. This way, the solution developed subtly tuned to take advantage of the strengths and expertise of the retail group while filling up existing weaknesses.

After a first presentation of low fidelity mock-ups of the three concepts, the team was asking the project initiator to decide on which concept to proceed with. The project initiator instead underlined the aspect, that all three concepts complete each other and build an overall concept. Therefore, they asked the team to go on with all three concepts that were combined to an overall solution to be called „SmartShopper" from there on. The three concepts, described in section 3, were constantly tested and evaluated regarding their desirability and the quality of the user experience, as well as regarding their business viability and their technical feasibility. To cover all these aspects, the team took advantage of their different studying background, by splitting the research according to strengths, explaining each other important aspects and procedures, negotiating with potential shareholders and implementing function and presentation. The expert- and user-feedback was integrated in several iterations. Components of the solution were dismissed, others further developed. Iteration by iteration, changes were becoming more marginal and the concepts more rich in details.

The application of low fidelity prototypes enabled the team at an early stage to redefine the solution without high costs and time commitment. Test-users dared questioning basic structures of the solution and did not only comply with pre-defined expectations as is common after high implementation spending. By division of tasks, the team kept a distinctive distance to the solution developed, while

always staying close enough to enable easy and fast feedback and creative input. The project initiator supported the team with critical feedback, network facilitation and motivation whenever asked, transmitting a big sense of trust and persuasion that supported team moral in difficult phases, when pressure, due to time constraints, was affecting the team.

3 SMART SHOPPER SOLUTION OVERVIEW

The innovative accomplishment of the SmartShopper solution is the successful combination of mostly already existing components into a conclusive, balanced solution, that matches user needs as well as the company's claim for viability while integrating their expertise in technical innovation and cross-linking to other industries.

In the following sections the single concepts are presented roughly with a special focus on selected features. The key achievement is the coverage of all aspects of grocery shopping while supporting individual preferences of the user and by this means enabling an outranged distribution market for the project-initiator.
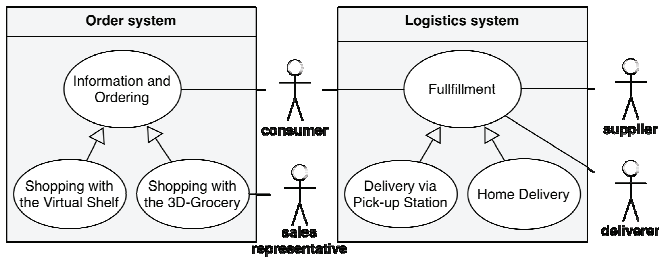

Figure 4: Use cases supported by the SmartShopper solution

The solution bases on the assumption that there are two major sub-processes of personal grocery, the first being information and selection (ordering) that is enabled by the virtual shelf and the 3D-Grocery solution. The second sub-process being the delivery of goods, where customers can choose between a home delivery service, pick-up at supermarkets or the pick-up station. (See Figure 4)

3.1 Virtual Shelf – visual shopping experience

The virtual shelf concept is a computer-based visual way for the selection of goods. The shelf can be used via dedicated terminals located at public places as well as with personal computers and modern smart-phones.

Modeled after real world supermarkets, products are presented in shelves at the visual level. Unlike traditional e-grocery platforms, the solution focuses on the visual user interaction to enable inspiring shopping, without a pre-defined shopping list. The user skims through the shelves, retrieves more information about a product without leaving the shelf and adds it to his order.

Distinct Features of the Virtual Shelf

In contrast to real world supermarket, the products presented in the virtual shelf can be customized to the individual customer's shopping habits and preferences. For example a vegetarian would not be confronted with any kind of meat, while somebody allergic to hazelnut could filter for goods not containing hazelnut. Furthermore the system adapts to preferences regarding price, high quality or family conditions if this is desired.

A specific project insight revealed that more than half of the weekly shopping basket always contains the same items. Selecting them iteratively is uninspiring and time-consuming. Therefore the shelf has a standard list feature. From there prevalently chosen items can easily be copied to the shopping basket all at once.

The ordering process can be interrupted at any time; items in the shopping basket always remain saved for later continuation, even at other places and devices. This enables interrupted shopping in short time gaps, which is very valuable for the target group.

The virtual shelf supports anonymous shopping for personal data sensible customers especially by means of the pick-up stations, which are explained in section 3.3.

Prototype of the Virtual Shelf

The scope of the design thinking project included the development of a running prototype for the virtual shelf.

In a design thinking process, prototypes are constructed as auxiliaries to evaluate a solution. During the project, multiple pre-defined questions were raised and multiple prototypes developed to get experts and user feedback on them. Here we describe the latest and most elaborated prototype.

The main questions tested through the prototype were:

- Simplicity. How self-explanatory is the functionality of the shelf?
- Desirability. Is it possible to enable inspiring and pleasant shopping with a web-based virtual shelf solution? Under which circumstances can shopping at the virtual shelf be a true alternative for the projected target group?
- Usability. What are the limitations regarding size and number of products per shelf, overall number of shelves per category, etc. for different devices?
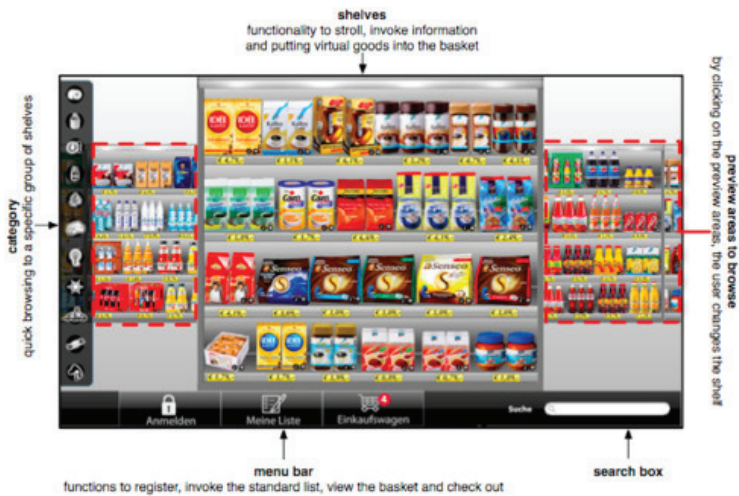

Figure 5: Main screen of user interface of the virtual shelf

3.2 3D-Grocery – Virtual Conjointly Shopping

This solution allows conjointly shopping despite dispersed locations and was created for the need of social interaction while shopping.
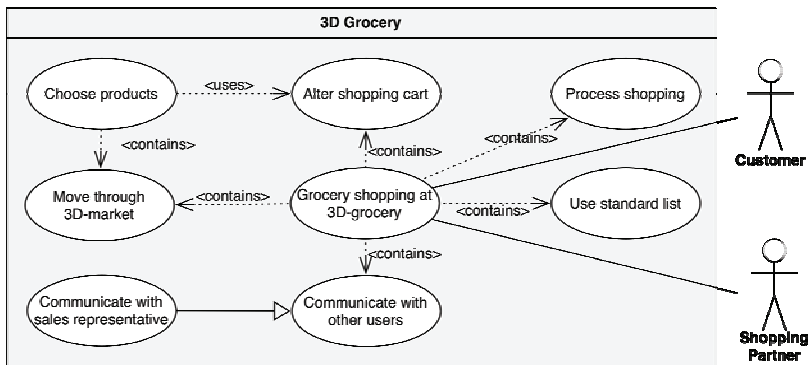

Figure 6: The figure depicts the use cases supported by the 3D-grocery

The concept consists of a virtual supermarket in a simulated 3D-world through which the user moves with the aid of a virtual character (also: avatar). Users can communicate with each other via voice, text-chat or gestures. Beyond the collaboration between customers, shopping assistants can be consulted while shopping. A possibility for the realization is setting up a virtual supermarket within an existing virtual 3D-platform (e.g. sMeet.de).

Figure 7: Visual mock-up of the 3D-grocery.
The green telephone receiver indicates that this user is dialed in via telephone

The user chooses between 2 different viewing perspectives. In the bird-view perspective the user gets an overview of the departments in the market and of the location of other guests. Here the user moves his avatar between departments and shelves or engages with other avatars.

The second perspective is at eye-level. The user sees his character in front of a shelf, the products of the shelf as well as other avatars, representing other users. This view is designed for the selection of individual products and communication (consultation) with others shopping. In the eye-level perspective, users can move their avatars slowly through the market and see the content of the shelves they come across. This creates an inspiring shopping experience.

All users in the 3D market can communicate with each other via text and voice. The main communication features are:

- Text messaging between 2 or more users (uni- and multicast).
- Text messages to all current users (multi-cast).
- Synchronous voice conversation with other users in dependency to the distance of their avatars. This means all users are connected with a voice service per voice over IP or telephone. The distance between the avatars indirectly controls the volume and there is a maximum distance beyond which no voice conversation is possible.
- Private voice conversations between 2 or more users.

The 3-D grocery shopping experience gives the target group the chance to enlarge their private time through spending time with people of their choice while doing something they need to do anyway. Furthermore, grocery shopping is this way perfectly integrated into their daily routine. No matter where their business trip leads them, in the evening their goods will be at the location of their choice. Another advantage is the possibility to decide in a cooperative way, which is an important fact especially for couples, where he is often sent shopping what she or both will prepare later. Wrong choices often cause discontent, which can be avoided through a shared shopping experience.

From the business point of view, it is especially attractive to go for cooperation with an existing platform. This way, one could build up on an existing community and on an effective development expertise (know how).

The project team did little iteration on 3D prototypes due to a very close cooperation to a project partner who took over the development of this solution. The broad user base of the partners existing 3D-world, as well as selected young urban professionals had been asked for feedback on several

specific aspects of the design in advance and features added to the solution. After all, the feedback of both, target group and 3-D world user group was so positive that the solution itself was not questioned any longer. That was when the solution had reached a level, where the project team handed it over.

3.3 Pick-Up Station – Timely flexible hand-over

The pick-up station completes the SmartShopper concept on the fulfillment side. Successful services address the user experience in a holistic way. The pick-up stations shows how broad the project team understood the challenge and faced it from different perspectives working with different expertise and partner.

The columnar shaped pick-up stations are positioned at highly frequented public places like train-stations, city center or traffic junctions. An automatic sliding door opens after the customer entered a PIN and the goods can be taken out. One grocery shopping may consist of multiple boxes due to number of items and differing cooling requirements of the goods. All boxes can be set to different temperatures. The boxes are internally organized in multiple carousel layers that spin to place the boxes corresponding to one customer behind the shifting door before it opens. The cooling system is integrated into the carousel. The outer surface of the station can be used for advertisements.

In contrast to the direct, home delivery, the concept of the pick-up station allows flexible hand-over of the ordered goods. Home delivery services typically require a pre-defined four-hour time window, were the customer needs to ensure his availability at a given address. The research revealed that the desired target group attaches high value to flexibility and self-determination. Furthermore anonymity is of high value for large parts of the target group. The pick-up station fills this gap of existing services in the delivery side of the concept.
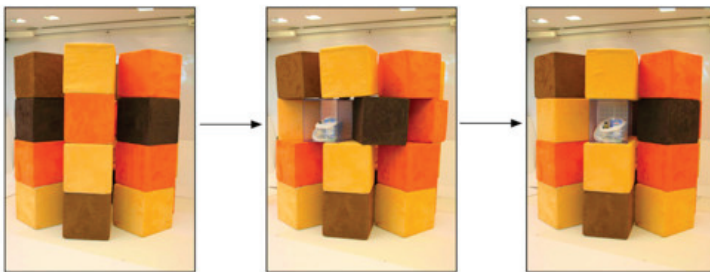

Figure 8: An early prototype of the internal box carousel of the pick-up station

(Source: HPI School of Design Thinking)

The pick-up station is a good example for solutions that are as well technical feasible, economically viable and desirable by the user. Compared to outlets, pick-up stations are considerably cheaper to run and to maintain. Furthermore the stations are attractive regarding sustainability as they consume less energy than take-out cooling boxes of stores. Related research also reveals that handing over products through an intermediate container (i.e. the pick-up station) is more efficient than the direct door delivery [10]. For customers it is a desirable solution in regards to time flexibility, way efficiency and respect of anonymity.

4 CONCLUSION

In this paper, we have outlined principles of the design thinking methodology and their value to design projects, by describing the challenge, progress and results of a use case project for a major retail group. The example underlines the clear trend for the innovative value of design thinking. A challenge that had been object to months of work for a well equipped innovation department of a world wide acting major retail group without satisfying ideas, has been faced by a small group of four students to an overwhelming satisfaction of all stakeholder. How was that possible? We state the hypothesis, that the 4 students took advantage out of the fact, that

- There was no censor, as there usually is, in a organizational setting
- They managed to built up an atmosphere of trust among the team
- They were inducted and trained with a creative space, tools and process, giving them as well

creative freedom, as a shared guideline through a diffuse topic without narrowing the challenge too early.

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