

Designing a product for learning **Visual Thinking**



Master Graduation Thesis
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GRADUATION REPORT

"Designing a product for learning Visual Thinking"

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PREFACE

Almost every person you know has learnt how to read, write and calculate. Literacy and numeracy are skillsets we use everyday, with pencil and abacus, or keyboard and calculator. It can be said that seeing is one of the first skills we start learning, long before even talking: we are all experts at it. Yet learning the skill of making drawings by hand only seems to produce either stupid doodles or beautiful art.

Finally we are starting to use hand drawings more effectively for communication and helping us think in a visual way: Visual Thinking (VT). For example in the fields of product design and marketing.

Learning visual thinking isn't part school curriculums yet, it is now learnt primarily out of people's personal motivation. Self-taught through information from books, websites, videos, other media and experimentation. One emerging company in the field of visual communication is the Dutch 'Jongens van de Tekeningen' (JvdT)

This graduation project explores a new design of an interactive product for the JvdT, that helps people learn visual thinking for application within a company context.

ABSTRACT

Visual Thinking is becoming an increasingly important and popular skill to learn. Yet currently there are relatively few products and methods available to people for learning it. This creates the opportunity to design a new product for learning visual thinking.

The design of this product requires an understanding of how visual thinking itself works, and of the users and their context for which the design is done. Literature studies, in-depth-interviews and observations provided insights on the context of the target users who want to learn visual thinking. The understanding of the target users and context is formulated in the user model and the project design goal:

"Design a digital interactive product, that facilitates the learning process of visual thinking and enables users to apply it in a company context."

The context and user understanding form the basis for the project's design phase. Through several iterations concepts were designed, tested and refined until they formed the basis of the final design.

The final design is named PaperPlane. It is a digital web-based platform that facilitates people in learning the skill of visual thinking. PaperPlane offers users an new interactive way to learn visual thinking in cycles of four steps: By viewing the content, practicing, applying, and reflecting. Users learn by going through courses made up of small modules. Inside the modules is the learning content in the form of images, videos and other media, or links to external resources.

Users practice by doing drawing exercises in every module and directly apply their visual thinking skills in assignments at the end of every course.

The platform then lets users reflect on their learning process and drawings individually, and also in the form of a social system of peer reviews.

During the learning process the platform guides people, but at the same time provides autonomy and a non-linear learning path, where the learner is in control.

Outside of the learning process, PaperPlane provides two tools for enabling users apply visual thinking in their work. One is the Story Tool, which functions as a wizard for visualising stories from users' work context. The other is the Visual Library; a collection of example drawings, templates and inspiration. These tools can be accessed from anywhere at any time in the platform.

The design was evaluated with a final test of user experience and product usability, showing that the design fulfils the design goal.

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ORIENTATION

1. INTRODUCTION

We live in the information age. A time and culture where there is an abundance of information around us 24/7. We perceive all of it with our human senses; hearing, touch, taste and smell. The largest part of our perception however is seeing: our brains dedicate a lot of processing power to the visual stimuli entering our eyes.

Some of this is written text, a visual means for communication. With the increase of information and communication and the advent of digital media, there is a growing attention for images instead of text.

Although using textual language for communication is taught in schools around the world, using visual language is not. The skill of using drawings as a visual language, to help yourself think, and communicate, besides using text is called 'Visual Thinking' (VT for short). This project is about designing a product to help people to learn that skill.

1.1 Motivation

The motivation for this project comes from this project's client company Jongens van de Tekeningen (JvdT). This company has organised their work around the skill and process of visual thinking.

The start of this project comes from the companies' direct experience of how useful visual thinking is for their clients, helping them think, solve problems and communicate. At the same time it was noticed how few people are aware of the existence and use of this skill. These two observations extended beyond their clients, to anyone else unfamiliar with visual thinking.

This led to the development of visual thinking workshops for clients. A successful 'product' of the JvdT, developed since early 2013. For these workshops employees have to be physically present and involved during the course. More or larger workshops require more employees present and more of their time, making it difficult to scale this product.

The three factors described (usefulness of VT for companies, unawareness of VT by many people and the JvdT companies' current knowledge and experience with teaching VT) create the challenge and the motivation to start this design project:

usefulness + unawareness + knowledge and experience = the design opportunity

The opportunity being a new-to-market product that can be scaled up and sold in addition to the current product portfolio of the JvdT company to more people effectively.

1.2 Company Introduction

This graduation project is done for the company Jongens van de Tekeningen (JvdT, 'The guys who draw'). It is a small company of 6 employees total, based in Delft. It was started in mid-2012 by the company Club van Delft VoF, who initially used visualisers only during live 'thinktanks' and brainstorm sessions for companies. In these sessions students from technical universities work together with clients. Visualisers would summarise the generated work and ideas from these sessions in a visual way. The Jongens van de Tekeningen was started when companies asked to hire visualisers separately, without thinktank sessions. Currently JvdT functions as a label of the Club van Delft.

The core business of the JvdT is making hand-made drawings for companies to help them work, think and especially communicate better in a visual way. The company vision is "Helping people with ideas worth spreading", akin to the motto of the TED nonprofit organisation.



figure 1.1 A stylised visualisation of the current employees of the Jongens van de Tekeningen

1.3 Assignment

The assignment is derived from the design opportunity and is stated as follows:

Design an interactive, scalable product or product-service system that helps people learn visual thinking and apply it in their work context.

The new product's functions will be centred around learning, which places an importance on the interaction between the new product and the user. This makes interaction design relevant for the design of this product.

Scalability for this assignment means the design should allow and accommodate a larger scale of use and a larger amount of users simultaneously, without the restrictions on time or location that current visual thinking workshops and other visual thinking courses have.

Problem Definition

Visual thinking is increasingly applied outside the design professions where it started, e.g. in education, business, group facilitation and consultancy. The ways of learning VT for the people in these professions without a visual- or design background are limited. Currently the main methods are learning through live workshops, online video chat, video seminars or illustrated books. Live workshops are interactive but are not scalable. Books are scalable but are not interactive.

The problem for the user and opportunity for the design is that there is currently no product that helps people to learn visual thinking in an interactive way on a large scale.

The scalability of the design concerns both the increased amount of users that can simultaneously use the product and the low amount of employees of the Jongens van de Tekeningen involved in the operation or production of the product.

1.4 Approach

This design project consists of three main phases: the Context&User Analysis, Design and the Evaluation phase. In every phase different activities and techniques are used.

Context & User Analysis

In the research phase the users and their context are analysed. Besides the designer's own knowledge and experience of the JvdT company, in-depth interviews were used as a method to find the user's problems with learning visual thinking. These interviews are held with the target users to find out motivations, problems and expectations in regard to drawing and learning VT.

Simultaneously the possibilities and working mechanisms of visual thinking are defined. The context of visual thinking is explored, through literature studies and publications by other leading visual thinkers. This context covers the areas of motivation and education, for which experts in their respective fields were interviewed.

The information from this phase the analysed and used to develop the user model and design goal to be used in the design phase.

Design

The design phase is started with the design brief, stating the design goal and interaction vision resulting from the research phase. Together with the user model this is the input for the ideation and conceptualisation of the new product. In early tests ideas are tested, then iterated upon. To support ideation and concept generation a brainwriting session was organised. New concepts are tested for interaction in user tests with digital- and part-paper prototypes. From the design iterations, the concepts lead up to the final product design.

Evaluation

In the evaluation phase the design is prototyped and tested with the target users and to evaluate on the design in regard to the project's design goal. Recommendations for the design are then given for the future development and use of the designed product.

2. WHAT IS VISUAL THINKING

Before the design and user research can start, visual thinking itself was first analysed and defined. Based on existing experience and knowledge from the JvdT company about visual thinking the following definition is developed:

EN: "Visual thinking (VT); facilitating communication and thinking processes by hand made visualisations."

NL: "Visueel Denken; met handgetekende visualisaties communicatie en denkprocessen faciliteren."

Visual thinking is a collection of creative practices using handmade drawings to facilitate the processes of thinking and communication, much like the way a language functions. VT can therefore be regarded and used as a visual language. In material from recent years such as the TED presentation by Tommy McCall (May 9th, 2011), the term **graphicacy** is used to identify visual information and communication (including visual thinking) alongside **literacy** and **numeracy**, attesting that it functions similar to other languages.

Graphicacy is also defined by the American Society for Innovation Design in Education (ASIDE), to include drawings for communication, see figure 2.1. What makes visual thinking for this project different from the more general term graphicacy is that it focuses only on hand made drawings.

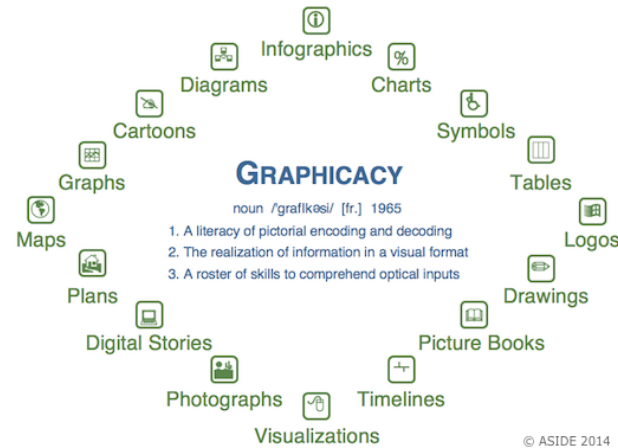


figure 2.1: The definition of Graphicacy and all included visuals posed by ASIDE

Visual thinking's main function is to express and communicate information, by making it visual to the user on another medium. (e.g. drawing on paper or iPad), to help people interact with that information to support a thought process and communicate to others. The thought processes in a person's mind are called a mental model (MM), see figure 2.2.

Visual thinking is not one specific style of drawing, but does differ from other types of drawing by what goal it is used for. Simple and rough sketches can be made fast, and changed and improved on fast while maintaining clarity which fits communication.

Visual thinking is sometimes used by product designers, but is not the same as product design drawing, since visual thinking is not restricted to the goal of only visualising and designing products. VT can theoretically be done by anyone who is physically able to see and draw.

Visual thinking through drawing is done relatively little compared to writing and therefore not always effectively used. Visual thinking seems to be a powerful yet undervalued tool by many people in disciplines outside design. This is supported by the JvdT company's experience with visual thinking for businesses.

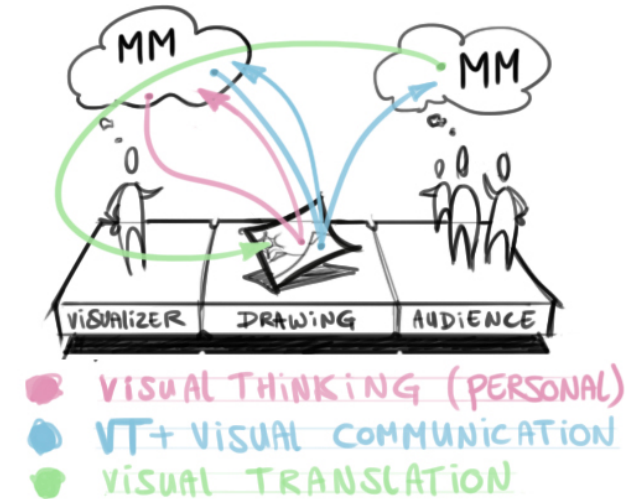


figure 2.2: A simplified representation of 3 types of visual thinking. The 'thinking clouds' represent mental models, the coloured arrows represent the flow of information. The image itself is also an example of what visual thinking drawings can look like.

The Visual Thinking Skillset

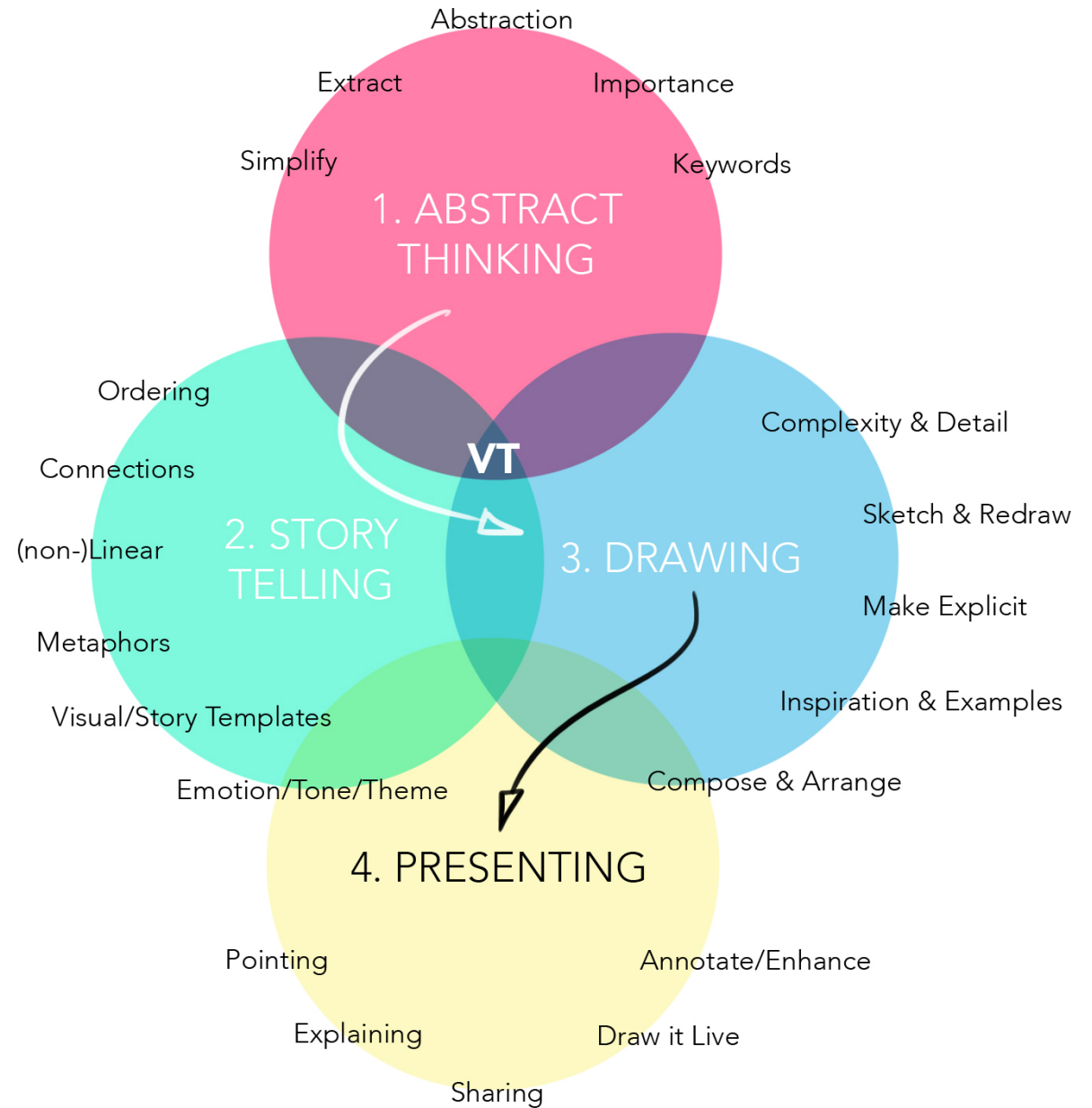
Visual thinking is not just one skill by itself. It depends on a set of several different skills that can individually be trained. This subset of skills that make up visual thinking is broad: it can include many skills motor skills, social skills, or even 'seeing'.

Not all relevant skills can be focused on in this design project, or implemented in the design and prototype. Therefore a selection of 4 indispensable VT skills is made to base the design on.

Each skill has its own defining activities, and can be represented in key terms. An overview of the 4 skills is given in figure 2.3.

From these four skills, the 4th one (Presenting) is considered indispensable for visual thinking, but not crucial for learning within the new product. From the analysis of the current visual thinking workshops and the target user is learnt that presenting is a skill already exhibited by the target group. People like to explain their drawings to others. In addition this skill is more difficult to train in a digital environment. This is why the presenting skill is not part of the learning process in the final design.

figure 2.3, right: An overview of the 'visual thinking skillset'. 4 Core skills indispensable for visual thinking visualised as overlapping circles. Important activities and keywords that define the skills are placed around the circles in black. The arrows indicate the sequence in which the skills are used in the visual thinking process.

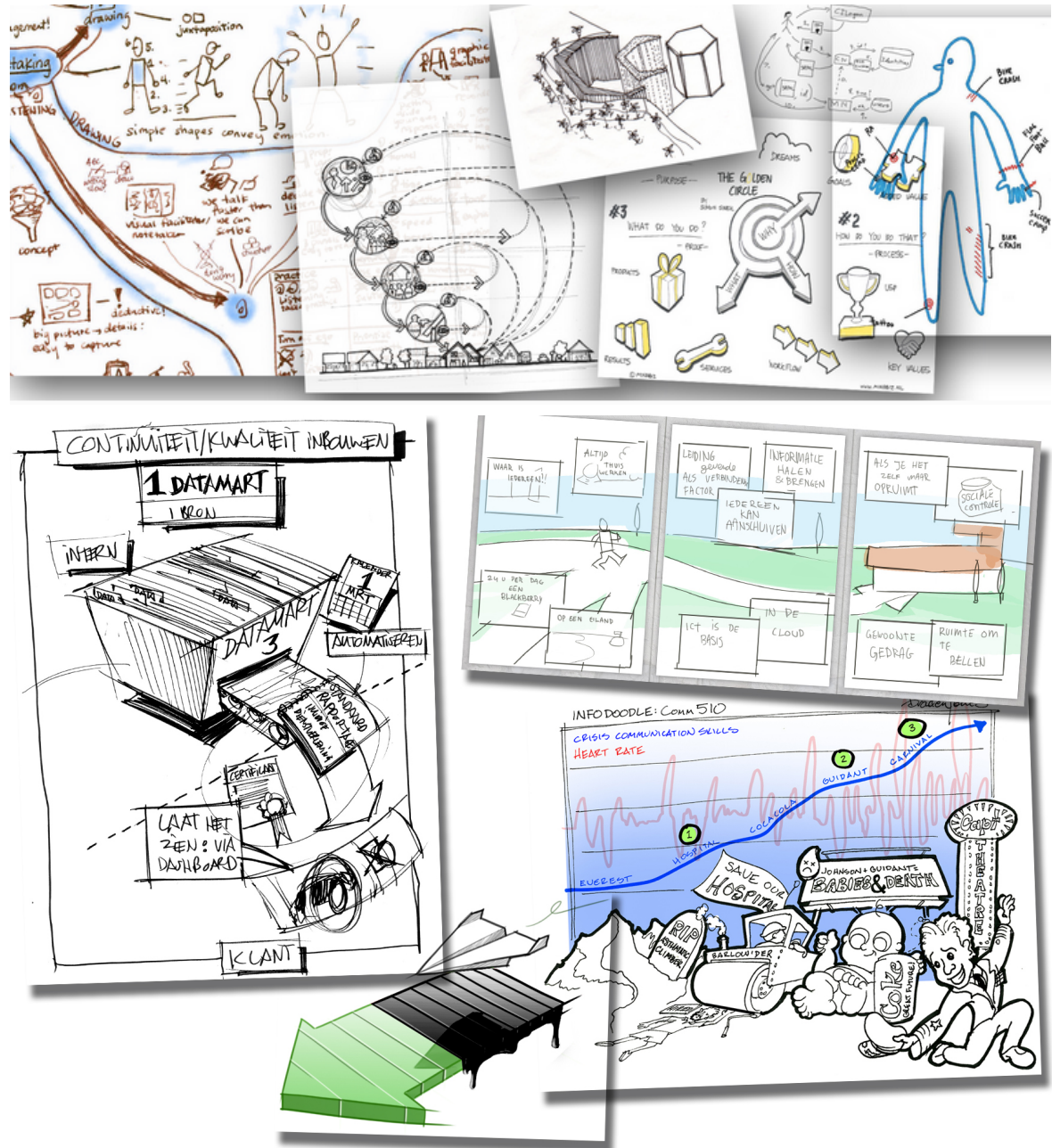


What Drawings Are We Talking About

There are different ways visual thinking can be applied, in many different scenarios. The roughness, speed, level of detail, level of abstraction, medium and techniques can all vary. In practice this results in different products offered by companies or individuals using visual thinking. An indication of the type of drawings produced by visual thinking is shown in figure 2.4.

For professional examples of visual thinking in practice, visit the website of Jongens van de Tekeningen: www.jongensvandetekeningen.nl

figure 2.4, right: A collage giving an impression of the types of drawings commonly produced by visual thinking.



Types of Visual Thinking

Looking at the application of visual thinking, different types of visual thinking can be discerned. For visual thinking in this project only hand-made drawings are considered. An overview of these different types is displayed in figure 2.5.

Abbreviation	Type of visual thinking
PS	Personal Sketches
VTr	Visual Translation
VC	Visual Communication
GF	Graphic Facilitation
GR	Graphic Recording
AN	Animation
IL	Illustration
SN	SketchNoting
DD	(Industrial) Design Drawings
CD	Concept Design
EN	Entertainment
IG	Infographics
MM	Mind maps
SK	Sketch Kits

figure 2.5: Different types of visual thinking and their abbreviations.

These different types of visual thinking can be compared to each other in terms of the realism depicted by the drawing and the frequency with which they used by people, this is done in figure 2.6.

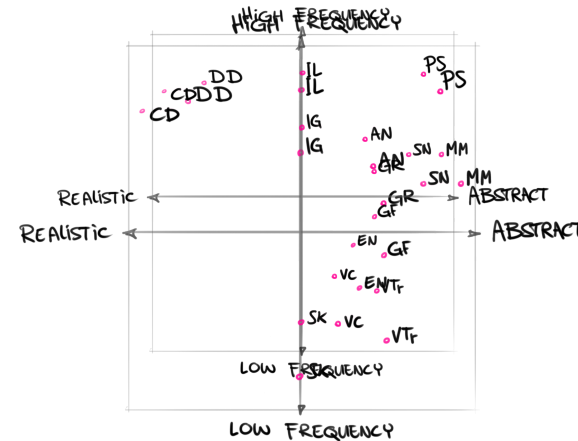


figure 2.6: The frequency and level of realism of different types of visual thinking, relative to each other.

The most interesting and efficient types of visual thinking for use in the new product are those that are accessible to new users. When the drawings are more abstract, and less realistic, they require low effort in terms of time spent, skills and materials needed, but are still effective and produce good results for the user. This is because the relation between effort and results is not linear, but curved as shown in figure 2.7. Meaning that with little effort, relatively large results in terms of realism and meaning can be achieved in drawings. The types of VT that the new product should focus on are therefore the types on the right side of the the graph in figure 2.6, mainly Personal Sketches, MindMaps, Visual Translation, Visual Communication and SketchNoting.

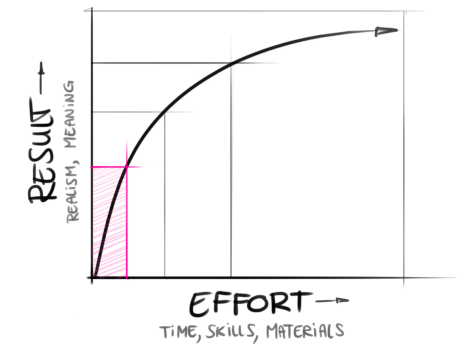


figure 2.7: The curve illustrating the relation between effort put into drawing, and the result of that effort. An efficient, user-accessible area is indicated in colour.

Visual Thinkers

Looking at what people use their visual thinking skills for, and with or for who any visual thinker can be mapped on the 2-axis scale in figure 2.8. Horizontally for who VT is done; larger groups or small ones (even only yourself). Vertically for what goal: presenting or creating drawings. Any visual thinker can be a combination of different profiles.



figure 2.8: A classification of four scenarios in which visual thinking can be applied.

Characteristics and value of Visual Thinking

From researching visual thinking through literature, articles and presentations its possibilities are explored. Important insights into visual thinking and the human visual system are found. These characteristics create the value of visual thinking and are conveyed to the users through the product content. They are also taken into account during the idea generation and concept design phases.

People respond better to rough hand drawings than clean visualisations.

Participants respond better to hand-drawn images, no matter how rough, than to polished graphics. It makes it safe to offer up half-formed ideas for consideration (Van der Lugt, 2002; Pearse, 2007; Roam, 2008. pp. 25).

Rough sketches offer a way to stimulate people to reflect deeply and respond to others openly (Mckim, 1972. pp. 103 & 111; Van der Lugt, 2002; Roam, 2008. pp. 25).

The spontaneity and roughness of hand-drawn pictures make them less intimidating and more inviting (Mckim, 1972. pp. 119; Pearse, 2007).

People perceive visuals globally first, then detailed later.

The visual perception of people proceeds "from global structuring towards more and more fine-grained analysis" (Navon, 1977).

This is people's nature to extract from a general view of a picture more and more as they keep looking at it. Roam D. (2008, p.80) proposed the process of individual visual thinking as four steps: "Looking", "Seeing", "Imaging", and "Showing"

Slower thinking process allows people think systematic, and deeper, to find consensus and see problems, faster.

Visual Thinkers provide people a means of systematic thinking to gain the clarity of complex issues (Agerbeck, 2004; Pearse, 2007) by taking advantage of people's natural abilities to simply get information by receiving it visually (Navon, 1977; Roam, 2008, pp. 70).

With the help of live, instant sketching, people can think fluid and slow down their thinking instead of being rushed into another issue (Mckim, 1972. pp. 7; Pearse, 2007; Roam, 2008. pp. 45).

People have enough time to get an overview of a situation before they make decisions. Therefore, visual thinking actually speeds up the process because time spent in trial and error is shortened (Mckim, 1972. pp. 111; Horn, 1998. pp. 234, 209-210; Van der Lugt, 2002).

The visual information can pave the way to understand each other, lead people to a right decision and taking actions (Pearse, 2007).

Graphics together with text affect us both cognitively and emotionally, and help us document, retain and recall information.

Cognitively: Graphics expedite and increase our level of communication. They increase comprehension, recollection, and retention. Visual clues help us decode text and attract attention to information or direct attention increasing the likelihood that the audience will remember (Levie, Lentz, 1982).

Visual thinking can engage people with the live creation of drawings. Drawings will eventually become a document of the drawing session's progress and final conclusions. People can always recall their creative and inspiring ideas in the sessions on the products of visual thinking (Agerbeck, 2004; Pearse, 2007).

Emotionally: Pictures enhance or affect emotions and attitudes (Levie, Lentz, 1982). Graphics engage our imagination and heighten our creative thinking by stimulating other areas of our brain (which in turn leads to a more profound and accurate understanding of the presented material). (Bobrow, Norman, 1975) It is no secret that emotions influence decision-making: "emotions play an essential role in decision making, perception, learning, and more, they influence the very mechanisms of rational thinking." (Oostendorp et al, 1999)

CONTEXT & USER

3. CONTEXT ANALYSIS

In the context analysis, the context of the future product for learning visual thinking is researched. It is divided into three parts: research into internal products, external products, and learning.

First, internal product research about what can be learnt from the current JvdT products that focus on visual thinking. Second, externally on current competing products for learning visual thinking. Third, on Learning, including the related area of motivation.

Research Questions

The context analysis is done in order to find guiding principles for the design phase. This includes insights on visual thinking from products and ; what can be learnt from These insights function as a guide for the design phase. The main research question in the context analysis phase is:

What activities are needed How can a product teach the skill of visual thinking, to create most value for users?

This question is mainly answered by doing user research, literature research, and interviews with third party experts. This research contains the following sub-questions:

- How does visual thinking work, and on what mechanisms and techniques is it based?
- How do people learn skills through software on a digital product.
- How could people improve their visual communication and thinking skills through a product? This question defines the user research.

3.1 Internal Products

One products the JvdT Company offers is the 'visual thinking Workshop'. This is currently the only product that involves clients learning visual thinking. Three workshop session have been attended and are analysed in order to gain insights to improve the new design.

Workshop Structure

The are group sessions of half a day and are given by 2 or more instructors from the JvdT. Clients use it to train their employees in visual thinking, so they can later use the skill for their work. The workshops have a group size of around 10-20 people and is given in a workshop room on location. All materials are provided for by the JvdT.



figure 3.1: An impression of the visual thinking workshops, showing the individual exercises right, and the and team assignment left.

The first half workshop and presentation slides are structured into 3 similar cycles, with the total duration of 2 hours. Each cycle consists of 4 steps that participants are guided through. The 4 steps are:

1. **Learning:** participants watch the presentation slides and listen to the explanation of the instructor.
2. **Practicing:** during the presentation and live drawing demonstrations participants individually draw along with the instructor. This is basically exercise by copying drawings using techniques from the presentation.
3. **Applying:** small exercises with a time limit of around 5 minutes where people individually draw. The difficulty of the exercise increases with each cycle: from drawing how a toaster works, to drawing how democracy works.
4. **Evaluating:** The results from each exercise are evaluated by the instructors. Everyone can see all other drawings. Not all drawings are evaluated individually, but as a whole, with specific drawings being used as examples. In the second and third cycle the participants present their drawings to the group.

After the 3 cycles of learning, practicing, applying and evaluating, there is a break. The second half of the workshop is a larger (design) assignment of 1,5 hours. Group splits into smaller teams each working on another part of the assignment.

Insights from Workshops

The insights gained from analysing the workshop help to guide the new design. These insights come from direct observations over the course of the different workshops that were attended.

People need stimulation and activity when learning visual thinking, but also need regular breaks in between.

People's attention can easily be lost during the workshop if they are inactive or are not involved enough. Letting users draw along prevents this from happening too soon. After about 20-30 minutes the activity of the users decreases, and participants can look tired or request breaks themselves. Activity and rest should be balanced in the new design.

People can learn from both instructors and other participants. (Peer learning)

People's drawing style, handwriting, and interpretation of the drawing assignments are all different. Often people surprise each other with their individual drawings and drawn solutions when they are shared. During the evaluation of the exercises, only the instructor gives feedback, but people can still see and learn from other drawings.

People actively look for information that is useful to them at specific moments.

Especially during the second half of the workshop, when people draw in teams, people help each other and ask questions. On the concrete level of objects to be drawn e.g. "How can I draw a rocket?" to a more abstract level e.g. "What steps do we need to show to explain this event?". Solutions to these problems are first asked to team members, and only later to instructors if solutions can't be found. This shows people actively try to find

missing information for making their drawings, but this information should be offered at the moment it is needed by people.

People enjoy explaining and presenting their drawings.

After finishing an individual assignment, most people enjoy presenting their drawing to others, even if they are not satisfied with their drawing quality. They have the opportunity to explain what they have drawn and can directly point to each separate part of their drawing, explaining it step-by-step. Their presentation is their preparation and their drawing.

People selectively learn the information that they think is useful to them.

Often a relatively small set of examples or tricks from the workshop is retained and used in the drawing exercises and the final workshop assignment. This means

3.2 External Products

There are already products and methods available to people to learn visual thinking. There are relatively few, but they are competing products with the visual thinking-workshops by the JvdT. They will also compete with the new design in this project. The new design must identify itself with a competitive advantage.

The most readily available competing products are:

1. Books on visual thinking
2. Online instructor-led courses
3. Other visual thinking workshops

Current products and methods of teaching visual thinking are evaluated for their positive and negative characteristics.

These aspects of current methods of teaching visual thinking are presented in a table included in the appendix.

Similar & Competitor Product Insights

The three main conclusion drawn from current products relevant are:

Time & location are restricted

Many current ways of learning VT are restricted by either a time or a location restriction, or both. This means that the current products are limited in the number of people they can reach, and reach simultaneously: the products are not easily scalable for larger groups of users.

User motivation is assumed

Motivation for starting with learning VT is facilitated by some products such as books explaining the relevance and application of VT by showing real world companies and cases. Many other products assume motivation in users to start with learning VT, or even assume users to sustain motivation during the learning. They seem to rely only on user's intrinsic motivation.

There are more interaction possibilities

There are possibilities for more interaction for learning VT skills as only few products provide it, yet feedback and guidance is important to learners. As expected, digital platforms such as websites have more options for- and make more use of interaction for teaching VT, such as video conferencing through the internet.

3.3 Learning

As part of the context analysis, learning is a relevant area to research. Different models and strategies exist to aid in the design of products for learning. The models suited for learning skills, in particular drawing skills, were analysed and used in the design phase. Besides these models, insights into

These models

They influence the future product and its interaction. They are used to design the product

Experiential Learning

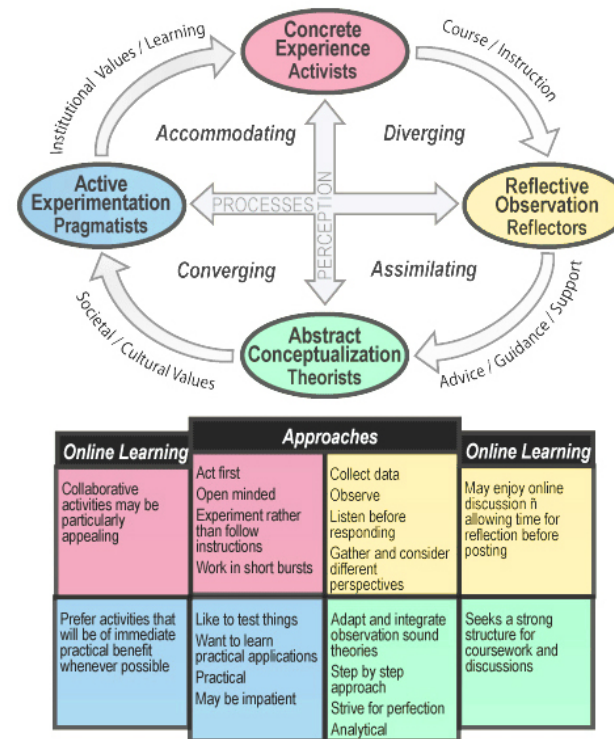
In any course that teaches a skill and does not only transfer knowledge, users are involved in 'experiential learning'. Also named 'learning by doing'. The Experiential Learning Model (ELM, or 'Kolb learning cycle') by David Kolb (Kolb, 1984) describes this process by dividing it into 4 steps through which learners go in cycles. See figure 3.2.

The four steps follow each other, but the learning process can be started and stopped at any step. Every learner has his or her preferences for one or more steps, creating four types of learners in this model

- **Experience:** The cycle starts with the learner having a concrete experience, like a practical (team) exercise.
- **Reflect:** This is followed by reflective observation where learners stop doing and step back and reflect on the experience, here questions posed.
- **Conceptualise:** Then during abstract conceptualization, learners interpret the previous experience. They communicate to others about it and develop theories,

usually by combining other knowledge they already have or learnt from other sources.

- **Experiment:** Finally in the active experimentation step learners plan to use their new knowledge in a relevant context for themselves.



Adapted from Kolb (1984) and Honey and Mumford (1982)

figure 3.2: The Experiential Learning Model of David Kolb, adapted by Honey, P. & Mumford, A. (1982), with the four steps and quadrants in a clockwise cycle.

Drawing is a practical, active skill that can improve by practice and experience, it is not only based on knowledge. This experiential learning model is therefore found to apply to learning visual thinking.

In addition, this model has proven itself in practice: all four steps of the model can be observed in the current structure of the visual thinking workshops the JvdT company offers. Therefore the model is selected to serve as a basis for the new product design.

Adult Learners

The selection of professionals in business as the target group for this project means that the future product users will include mostly adult learners. These are learners that are different from younger learners, often students enrolled in university or lower level education. Adult learners usually approach learning differently than younger learners and this is taken into account in the new design.

Adult learners are more self directing:

Issue:

They are more self-directed in their learning: learner-in-control for adult learners contrasts with teacher-in-control for younger learners.

Strategy:

They should be actively engaged in the learning process, as they want to have more than one medium for learning and want control over the pace of learning and start & stop times.

Adult learners are more involved**Issue:**

They bring more to a learning situation because of their wider experience and can take more away.

Strategy:

Adult learners should be able to make use of their previous experience and be respected for it, discussion, challenging of ideas and minority opinions should be permitted among learners.

Adult learners are need relevance**Issue:**

Adult learners require learning "to make sense" and be relevant for them: they will not perform a learning activity just because the instructor said so.

Strategy:

They should be shown how and where to implement their new knowledge and skills, as they want to apply it to relevant and current problems or situations. The learning material should be directed towards direct application (practice) rather than theory.

These solutions are strategies that are implemented in the future design to suit the preferences and learning style of adult learners.

(RIT; Lieb S. 1991)

Learner-in-control

There are different ways to organise control over the learning process. Traditional learning, such as in a school classroom, has the teacher in control of the time spent, the pace, the materials, etc.

Users can be given the space to interact with the product via their preferred personal learning style and have the feeling of being in control over the learning process, which is important to adult learners in the target group. For the

design of the product, no matter what feature is used in the product, the new product design should follow the learner-in-control approach.

This style of learning offers a nonlinear learning experience, where learners can start and end anywhere, according to their personal needs. See figure 3.3. This way the product's difficulty levels can be adapted to user better. Users know what skills they have and what they still need to learn. They can then actively find learning material they still need.

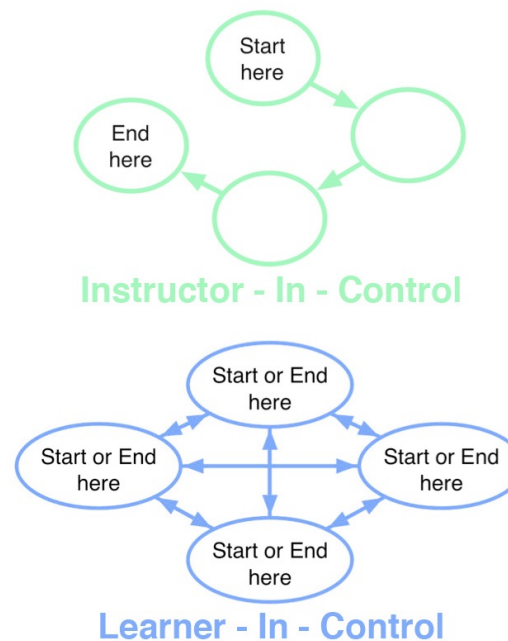


figure 3.3: The structure of instructors- vs. learners-in-control.

Gee's principles of good learning

The principles of good learning (Gee, J.P. 2004) are principles that come from games. They show how they can positively influence learning. A compilation of this list can be found at <http://www.psy.gla.ac.uk/~steve/best/gee.html>.

The principles are categorised into three sections: *empowered learners*, *problem solving* and *understanding*. These principles are all taken into account during the conceptualization and design phases of this project. They are all relevant to learning visual thinking, and overlap with theory on adult learners and theory on motivation.

Motivation

Any digital platform that wants to keep its users interacting with it, needs to motivate users. To find how motivation can be design in the new product a experts were interviewed and literature studied. From this research 6 important insights relevant to learning drawing skills through a digital platform were found.

Three factors influence motivation.

Three main factors are widely considered to influence motivation: competence, social relatedness, autonomy according to self determination theory (SDT). These three factors are all addressed in the final design.

Motivation should be created on two levels.

Motivation should be created on two levels:

1. Showing the power of visual thinking (to interest and show relevance of drawing in a work-context),
2. Giving feedback on building the skill of drawing. (V. Visch; interview at TUDelft)

The use of game elements (gamification) can create motivation.

Motivation to start and keep using the future product can be created by the gamification of learning. Gamification can make tasks like learning more enjoyable to do in a game world environment. A transfer effect can translate the knowledge and skill learnt from the game-world back to real-world scenario's. (Rosmalen, van P. 2013; Visch V. 2013)

The learning product should be adaptively challenging for users to maintain user motivation.

Skill & challenges for learning (or any other activities) should be adjusted to each other in order to reach a 'flow state'. This works best if this adjustment is automatic and continuous. (V. Visch; interview at TUDelft 2013).

Restrictions for users can decrease motivational barriers for drawing.

Restrictions for hand drawing such as a low available resolution on a touch screen, the medium, or the size of a brush tip, etc. can lower the motivational barriers for making hand made drawings. This is because receiving critique on a drawing from others can be blamed on an external restriction for drawing; i.e "it was a bad drawing because of the small canvas and the big brush".

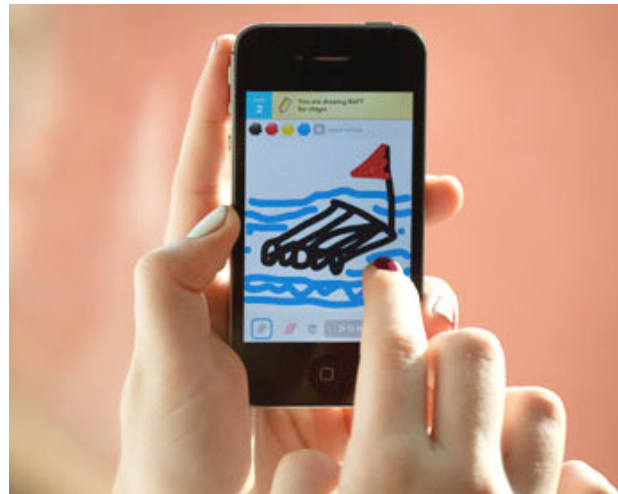


figure 2.: The application 'DrawSomething' being used on an iPhone, showing a rough drawing made with fingers on a small screen.

Anonymity can help softens criticism.

Criticism is perceived as more negative when it is more personal; anonymity can help to reduce this perception by removing direct personal connections. (V. Visch; interview at TUDelft 2013)

4. USER ANALYSIS

In the user analysis phase the target user is chosen and researched. The research is done by in-depth interviews with the target group. With the insights from the interviews the 3 research questions are answered and a user model in the form of persona's developed.

4.1 TARGET USER

The choice of the target group is made together with the JvdT company. Possible target groups are displayed the 6 layer model in figure 4.1. The 6 groups in this model are listed from being close to the JvdT company to further away in terms of knowledge and experience about visual thinking. Consequently they are listed from small- to larger group size.

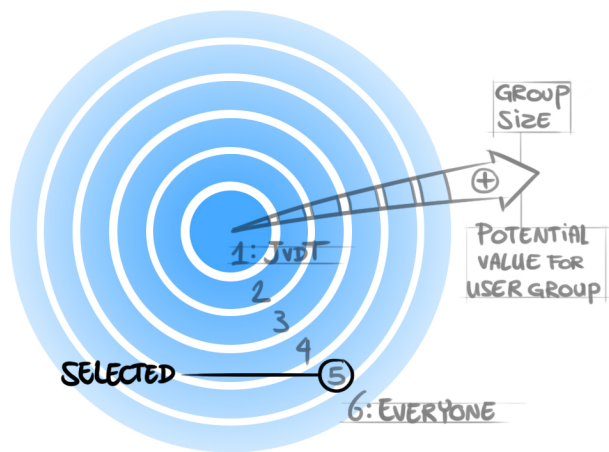


figure 4.1: The 6-layer model for selection of potential target groups

1. Jongens van de Tekeningen
2. Visual thinkers, facilitators, communicators
3. IDE/IO Students & Faculties
4. Designers (any kind)
- 5. People in Businesses/Companies**
6. Society, Humanity, Everyone who communicates

'Professionals in business' are chosen as the target group in this project as a result of mainly two motivations for the JvdT company. A motivation to enable the target group to support and improve their work through visual thinking, while simultaneously receiving value from the target group in return.

The potential value and impact any new design can have on a chosen target group is related to the novelty of visual thinking to them and their skill level in it. The skill of visual thinking has a potentially high added value to professionals in business because of the novelty to them. visual thinking professionals would receive the least added value from the new design, and are therefore not chosen as a target group for this project. In the design phase the target group can be divided into different subgroups and user types, as their specific motivations and goals are important to the design.

The final product and the related business model have to generate value for the JvdT company in return. Professionals and businesses have the means to pay for the product. Companies can also have a higher interest in other products and services by the JvdT company.

In the 6 layer model, only the whole of humanity potentially receives more value than professionals in businesses. A

4.2 USER STUDY

The user research in the context analysis phase is done through interviews with people within the target group. The purpose of these interviews is to find out the problems and needs users have or expect with communicating by visual thinking.

Method

The method for researching in the context analysis phase is live 1-on-1 interviews. This research is done by finding answers to the three main user research questions. The results of these interviews serve as a starting point for the design iterations. The interviews are done so that follow-up questions to answers can be asked for each question, and detailed insights can be gained, and motives for answers can become clearer.

The interview itself is divided into three parts, according to the three research questions. It transitions from communication in general to specifically about communication by drawing, and finally about the expectations of using the future product. The three main questions are:

1. *In what ways do people currently communicate in companies, and what problems are experienced with it?*
2. *How are drawings currently used for communication? And if they are not, what are the barriers for the user to draw?*
3. *What are the users's expectations of a new product that teaches visual thinking?*

Interview subjects

Interviews were held with four people from three different companies. They are found through contacts of the JvdT company and its employees. These companies are selected because they are not clients of the JvdT, and have no experience with any JvdT products. The companies are active in different industries.



figure 4.2: The participants in the interviews

Nightbalance, a YesDelft healthcare-product design company. Size: 12 employees. Interviewed: one product developer, one managing director.

Coachcenter, a coaching agency. Size: 7 employees. Interviewed: company owner.

Yes2Web, a webdesign/webcampaign agency. Size: 25 employees. Interviewed: managing partner.

The interview questions and key insights from these interviews can be found in the appendix, where the interview is detailed for each of the three main questions of the interview.

1. In what ways do people currently communicate in companies, and what problems are experienced with it?

These are the communication channels reported by the interview participants, ordered in perceived frequency of use, from high to low:

- live talking, face to face (sometimes with drawing)
- email (sometimes with drawing)
- internal chat messaging
- phone calls
- memo notes, post-its
- group presentation with beamer/powerpoint
- letters

Communication problems

Information Overload

People sometimes communicate complex stories, in meetings or presentations, and it is difficult to condense all information so that an audience pays attention and retains the information

Communication Scalability

Communication is not easily scalable, it takes exponentially more time and effort to communicate if the number of communicating parties increases.

Communicating Emotion Transfer

When not communicating in person but through another medium, it is difficult to transfer the correct emotions. It is easy to misunderstand emotional context or meaning in a message. Also emotions are said to be more important than facts (like numbers) in group presentations.

People Resist Change

People have existing ways to communicate, and resist changes in the way or medium of communication.

"Drawing feels like writing Chinese for many"

Wasted Effort

Effort is wasted on communication when the level of detail, quality or additional information in a message is higher than the receiver requires.

2. How are drawings currently used for communication? And if they are not, what are the barriers for the user to draw?

2A. Drawing use

Private Use

People sometimes use personal drawings in their own private notebooks, but do not use it for communication to others.

1-on-1

Hand-made drawings are now used in live, 1-on-1 meetings, and 1-on-1 conversations by email and smartphone messages. They are always accompanied by a written or oral explanation.

Progression

Drawings are experienced as a progression of steps when they are viewed by someone as they are made live.

Relationships

When drawings are used, people find they show relationships between things easily: a network structure, such as those

Anchor

Pictures (not hand-drawings) are used in group presentations to anchor a bigger concept or story to just one picture. "They [pictures] are like a little hook"

2B. Drawing Barriers

Possibility Awareness

There is an interest in using drawings to communicate, but people are not aware of the possibilities of where and how to learning visual thinking.

Basics

Knowing basic shapes and standard drawings make it easier to start a drawing and lower anxiety. Not knowing basic drawing skills is now a barrier.

Motivation

The relevance of drawing in a business context is unclear. This decreases the motivation to use drawings.

Anonymity

When there is no live or personal contact such as on the internet, the feeling of being held to high drawing quality standards is smaller

Limitations can be good

Limitations like low precision, and time limits in drawing games such as the smartphone application 'Draw Something' help people to shift blame for bad drawings to the medium/tool used.

Quality is a barrier

The quality of the drawing is a barrier, when the standards for it are set or even just perceived high: drawing quality (form) is emphasised over effectiveness of communication (content). This can create a feeling of shame.

Profiling

Drawing skill is felt to indicate professionalism & skill in other areas, it can function as a positive or negative indicator of competence.

3. What are the expectations of a new product that teaches visual thinking?

Analog

There is a strong preference for drawing analog, as it is familiar and easily accessible. *What* you draw (content) is found more important than *how* you draw (on what medium, or with what style or technique).

Control

Interviewees all want to feel a certain level of control of the learning process. They prefer to use the product in their own time, at their own pace and in their chosen location. The new product is seen as a personal skill-learning tool, and is preferred to be used in people's own location.

Time consuming

The product is expected to consume valuable time, users want to feel motivated to spend that time on the product

Channel

The product is expected to become a new communication channel that the can be used in addition to channels/ mediums they already have.

"The barrier for this way of communication is gone"

Results

Everyone indicated they would spend more time on the product if they see more direct results in the communication they do. Spending more money was also considered when the results are more clear.

4.3 USER MODEL

Personas

As a user model, personas were generated, that embody what was found in the user research. The personas help to ensure that the design fits the users' problems and needs. They are also used for explaining in the brainwriting sessions about who the intended user is. In this case it works as a form of sensitising by creating empathy for the target user.

The personas are presented on the next pages.

With the three persona's three skill levels of visual thinkers are introduced. These help assess the learning needs and wants of the users.

figure 4.3: A visual representation of the skill level, as seen on the persona pages. Here level 2 is selected.



Level 1: The Visually Unaware

The 'unaware', people who don't know about VT and never used it. at all and often don't know how it can benefit them. They need information and motivation to get started.

Level 2: The Unsure Explorer

The beginner, people who know about VT and that it is useful, but only use it sometimes. They prefer to use it for themselves individually. They need practice and good resources for answering their questions to develop their skill further.

Level 3: The Visual Beginner

The user, people who have a good understanding of how and when VT can help them and use it regularly, also in teamwork. These people are not experts, but know what they (don't) know and what they can still learn. They need even more diverse experiences with using VT to improve, and can still learn from experts.

On the persona pages the graph from figure 4.4 is used to provide an overview of what the persona wants or needs to learn (their goals). It also shows what type of visual thinker the persona is. This is determined by the goal for which they want to use VT in their company context (the vertical axis) and for who (horizontal axis). Each axis has a resolution of 4 steps, allowing $4 \times 4 = 16$ positions. On the left, there is a separate position for when the user wants to use visual thinking only for him/herself. The vertical axis is then no longer relevant.

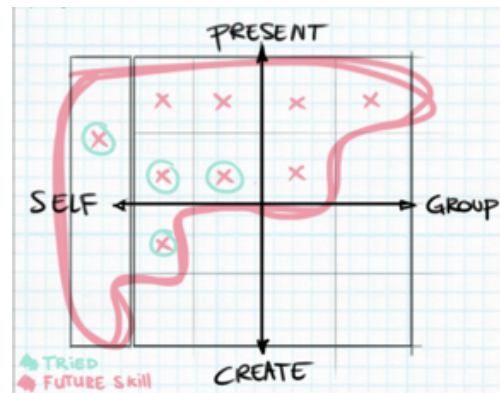


figure 4.4: An example of a graph depicting the method for indicating the skills yet to learn. In green any experience with visual thinking for each position on the graph.

User Focus for the Design

The product is designed so that all three different persona's are able to use the design. To not make the scope of the product prototype and user tests too broad, one persona is chosen as a focus. This is the persona 'Mark'. The Mark persona represents the average, beginning user. The other two persona's are more extreme, with Mischa being a more experienced visual thinker, and Chris completely without visual thinking experience.

To create a detail the concepts and design more detailed one persona is chosen as a focus: Mark's profile as a Thinker/Presenter.

Focus on StoryTelling

The JvdT currently regards visual thinking useful for three main activities: storytelling, problem solving and facilitation. For the design, Mark fits the role of storyteller (presenting) best as this is suited to his work.

Besides storytelling facilitation and problem solving are important applications of VT, and can have their own program within the product in the future. This is suggested in the final design in The functionality of the learning process in the product is designed to be the same for each program that teaches visual thinking. Only developing the storytelling program also keeps the scope of the product from becoming too broad: there is limited time and means.

Persona 1: Chris

WORK



Email, Skype, Ms Visio, Laptop & desktop pc
Desk meetings, Post-its, Coding

HOBBY



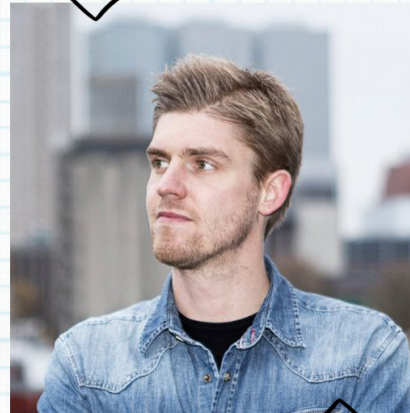
Gaming, HiFi-headphones, Piano

CHARACTER



Skeptical, Structured, Hard worker, Nerdy

Chris Holt



Personal info

32 years old
Software developer
Single
Studied Media&webdesign
VT level 1: Unaware & skeptical

Chris lives just outside the city. Travels by train. Has been working for 7 years, this is his 2nd job. Good at what he does, but during meetings & workshops with the 'creatives' from the designteam he is out of his comfort zone. Finds it difficult to quickly react to their proposals. He has to communicate with the other development team in Poland using skype's video and chat functions, but they don't speak good English.

THE "VISUALLY UNAWARE"

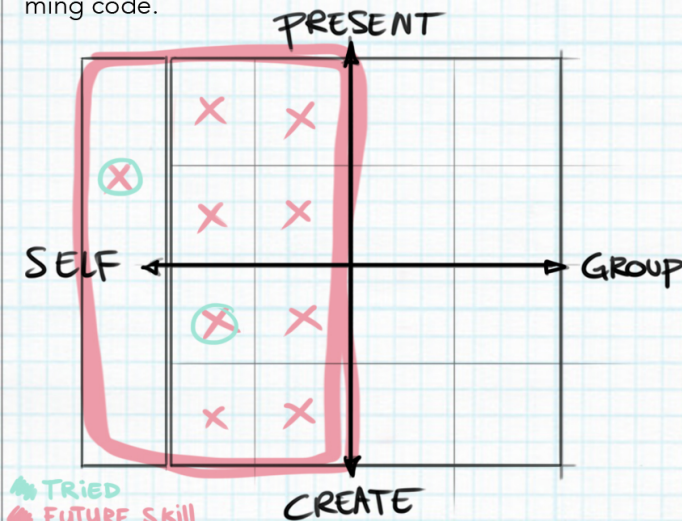


WHAT I THINK ABOUT VT:

Childish. Unnecessary; how could it help my work? Difficult to learn. Isn't VT just drawing? I just don't like it: I'm not an artist! I can't draw. I mostly write/type to communicate, but my colleagues don't read all of it.

WHAT I WANT:

(1) Be understood by the international dev.team abroad in Poland. (2) Get a grip on the nonlinear ideas and concepts of the design team: Communicate & interact better with them. (3) Not spend so much time on visualising my flowcharts. (4) Explain my abstract programming code.



Persona 2: Mark

WORK



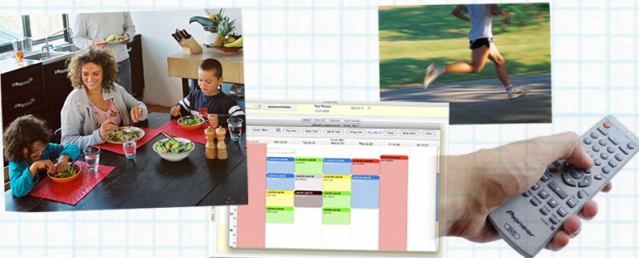
Email, Phonecalls, iPad & Personal notebook
Car navigation, Client presentations

HOBBY



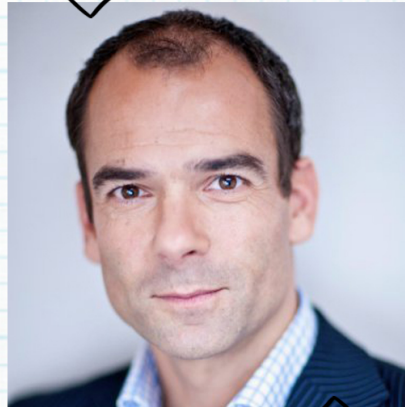
Cycling team, Fine dining, Online chess

CHARACTER



Familyman, Social, Assertive, Controlling

Mark van Hoven



Personal info

47 years old
Teamleader in consultancy firm
Married, two children
Studied 'Technical Management'
VT level 2: Interested & exploring

Mark is a father of 2 children. He is a professional at what he does and has over 20 years of work experience. Spends a lot of time on answering his email and phonecalls, even in weekends. He cycles as a member of a cycling club: he enjoys the competition but is a sore loser. His kids understand his iPad almost as well as he does. Always fights with his TomTom navigator. At work he is a control freak.

THE UNSURE EXPLORER

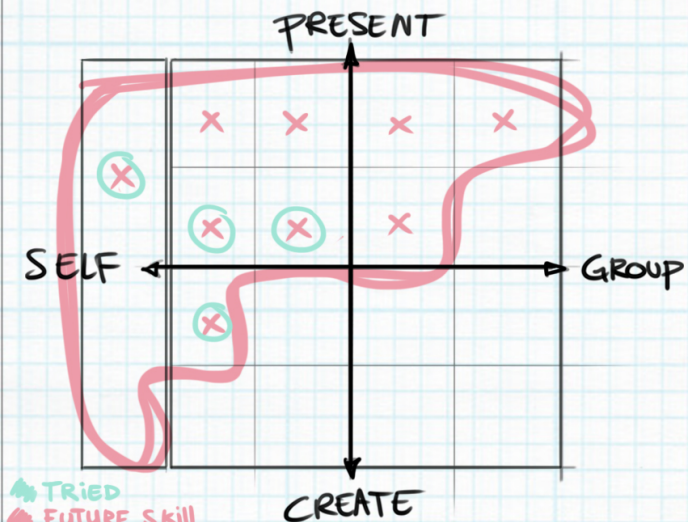


WHAT I THINK ABOUT VT:

Interested. Feels unstructured & difficult to learn. Unsure where & how to learn. I can only draw diagrams. Clients like visuals. Some people in my team draw too. Why use drawings instead of images in powerpoint?

WHAT I WANT:

(1) Communicate as fast as possible. (2) Engage clients in my story, emotionally. Convince them, (3) let them understand that I'm a professional. (4) Discuss actively with the team I lead, (5) remind them of our goals, company vision and their tasks.



Persona 3: Mischa

WORK



Email, Whatsapp, Moleskine,
Team sessions, Markers, Photography

HOBBY



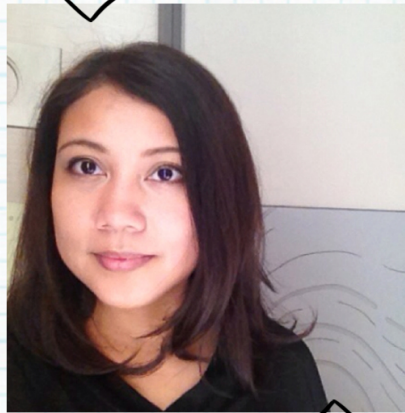
Yoga, Travelling, Singing+Radio

CHARACTER



Active, Multitasker, Creative, Teamworker

Mischa Delano

**Personal info**

26 years old
Junior employee, marketing dept
Living with boyfriend
Studied Marketing&Communicat.
VT level 3: Beginner & practicing

Mischa lives with her boyfriend in a new city center appartement. They work hard to pay their rent and prove themselves; both are working for less than one year. Likes to visit her family in Singapore during summer. Yoga every other day. Was best of her class. Very active, but still naive. Her colleagues don't share her view-points on how they can improve their teamwork: their meetings & brainstorms are not very efficient.

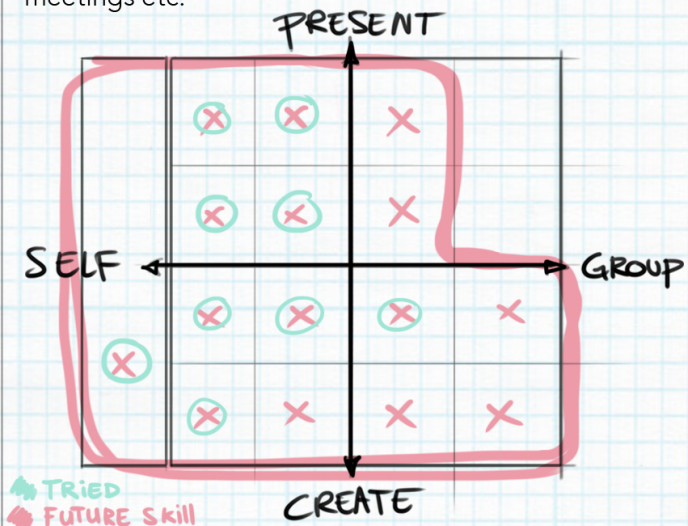
→ THE "VISUAL BEGINNER"

**WHAT I THINK ABOUT VT:**

Use color markers when I can. Feel insecure about drawing quality & childishness at work, but I know it helps my work&company. Photoshop feels easier. I did an art class for 1/2yr. Think I'm a 'visual person'; it makes me happy.

WHAT I WANT:

(1) Show my (drawing-)skills off to colleagues/boss. (2) Bring (my) creativity to my teamwork. (3) Visualise and share my ideas faster. (4) Get my colleagues involved in my creative work: create a shared understanding. (5) Feel unafraid to draw during group work, sessions, meetings etc.



DESIGN

5. DESIGN BRIEF

From the context and user analysis insights are gained to form the foundation of the design. In the design brief the design goal of the project is stated (the 'what'). Together with the interaction vision (the 'how'), they form the foundation for the design.

5.1 DESIGN GOAL

The main general goal of the project is to design a new product for the JvdT company in addition to the VT-courses they developed and currently sell. The foundation of the design is the context and user research. The design goal is:

Design a digital interactive product, that facilitates the learning process of visual thinking and enables users to apply it in a company context.

Digital means scalability for this project. In other words, the design should allow and accommodate a larger scale of use and a larger amount of users simultaneously without restrictions on time or location.

This project is about the design of the product itself: the tool that enables users to learn visual thinking. It is not the intent to design the exact content that is taught through the product, as this is content already exists in the current visual thinking workshops by the JvdT.

More important is the structure of the product, which says *how* the content is taught to the users. By what means, with what structure and with what interaction. This means *product function > product form > product content*.

Goal of interaction:

Providing a structure that enables users to learn, but feel in control simultaneously.

Combining experiential learning (learning-by-doing) with showing people what visual thinking really is: its not only about drawing, but drawings combined with two skills they already have: abstract thinking and communication.

Switching the user's views on VT, making use of strengths they already have.

5.2 INTERACTION VISION

The interaction vision speaks about the complete user experience of the new product, by describing the qualities of how the interaction should be perceived by the user when interacting with the product. The interaction vision for the design guides the concept development and the evaluation of it.

Interaction Vision

"Discovering treasure in an unknown land with the guidance of an experienced local guide"

Its qualities are:

- A sense of being guided and welcomed, but still in control of your actions.
- Feeling unafraid and interested to try something new.

Key Interaction Values

The visions for the new interaction signify what the design allows the user to do and feel with the help of the product.

Intuitive drawing and sharing, like children

Users should engage in drawing like they are children: Without seeing barriers for drawing or fear of critique. They are not afraid to show and explain their drawing to others,

Graduation Report R.D.Smit: 'Designing a product for learning visual thinking' leading to a positive practical experience with drawing. See figure 5.1.

Feeling the value of drawing and the mastery of a new skill

Users should feel like unafraid explorers that find, uncover and rekindle a hidden skill they can develop and master themselves. Users feel in control of when and where they learn from the product. They know how the skill of VT is relevant in their work and can transfer what they have learnt from exercises to their day-to-day practice. See figure 5.1.

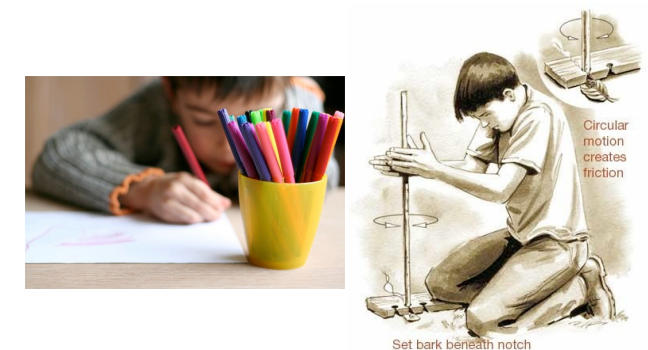


figure 5.1: Visual metaphors for drawing like a child and feeling the mastery of a skill.

A sense of being guided to achieve a goal.

Users should be guided through the learning process. They will know clearly that where they are, what they did and how close they are to their goals. User will feel that they are on the track and in control of their own learning process. Users should be able to stop or pause, and pick up where they left off without any problems, when they want, and where they want.

Feeling accompanied and unafraid to explore more

I want user to feel that they are not alone during learning VT. They know that they can also get help, from the product itself and also from other people who are also using it. By sharing and exchanging, the users feel more involved in the VT world and they encourage each other to go further .

5.3 Problem Statements

- People are not aware of what VT is, how it works. If they are aware they don't know how it can be relevant to their work.
- People don't learn the skill of visual thinking by reading about it. VT is not a knowledge-based but a skill-based activity.
- Guidance&Autonomy have to be balanced: The target user wants to feel in control of their learning process. They want to learn at own pace, make choices and do their own navigation. At the same time users need a learning structure/style that really enables them to learn
- People feel barriers to start drawing: too childish, too personal, too difficult, inexperience.
- Lack of communication and resource sharing. People explore VT by themselves and lack tips, encouragement, sharing that they could get from other users.

5.4 Requirements & Possibilities

From the context analysis, design goal and interaction vision, functional product requirements, possibilities and wishes are formulated to guide the design activities.

The design possibilities and wishes generated for these requirements all presented in the design requirements table in the appendix.

The requirements selected for use in the design are:

- **Awareness:** the product creates awareness of when and where visual thinking helps users think and communicate more effectively.
- **Motivation:** the product helps users to create motivation to start and keep using the new product
- **Experiential learning:** the product facilitates the experience of learning-by- doing for users.
- **Adaptive:** the product matches the skill of the user to the challenges of the learning material, through allowing
- **Learner-in-control:** the product has to facilitate the real or perceived feeling for the users (the learners) to be in control of the learning process.
- **Scalability:** the product should not have time or location constraints for users about when and where to use the product on a large scale, with a large user group
- **Modularity:** the content of the product is modular: it allows new content such as lessons, links or other material to be added after product release.

6. CONCEPT DEVELOPMENT

In the design phase, a product concept is developed by generating and evaluating ideas. This process contains a brainstorm session with other design students using a brainwriting method. Very rough concepts were sketched, based on the idea generation from the brainstorm and in two iterations the ideas evolved into two concepts. Each concept was tested with 2-3 users. The testing was more detailed with each iteration. During the iterations feedback was gathered internally from the JvdT company, and externally from test participants and other designers. Smaller sub-iterations were done within the iterations, but are not included in this report.

The most important features and functions of the design are determined throughout the concept iterations, and the final design follows from the concepts.

6.1 Idea Generation

Brainwriting

In order to develop a design concept, ideas were first created. Ideation was done personally and internally with the JvdT company. To also get a fresh perspective on the project and out-of-the-box ideas, a brainstorm session with 5 other design students was organised. See figure 6.1 for an impression. In this idea-generation session a large quantity of diverse ideas was generated using the 'brainwriting' method.



figure 6.1 Impressions of the brainwriting session

The project was introduced along with the target user, making use of the personas. Visual thinking was explained and discussed to create an understanding of the context for all participants.

Six 'How can you' questions were written down on 6 sheets of A3 paper. For 7 minutes each participant draws and writes a visual answer on the sheet. All participants pass their sheet clockwise to the next person to read, get inspired and remix the previously made drawings to create their own, and repeat the process of drawing until everyone has addressed all 6 HCY questions.

At the end everyone was asked to present their drawings to the whole group.

How-Can-You questions:

Each of the "How can you..." (HCY) questions was generated based on the design brief and requirements. Each question was discussed with all participants together, to create a good understanding and consensus on their meaning. The Original HCY questions and the version after the group discussions that were used during the idea generation session are the following:

1 HCY: Start with VT

How can you make people start with visual thinking, who think they don't know how to draw?

Rewritten into:

"How can you make people start with visual thinking"

2 HCY: Learn VT with other users

How can you learn from other people's visual thinking? (any part of the process: their abstract thinking / storytelling / their drawings)

Rewritten into:

"How can you learn from other people's visual thinking?"

3 HCY: Positive first experience

How can you make people feel positive about their first experience with visual thinking? (so they feel encouraged to continue and learn more.)

Rewritten into:

"How can you make people feel positive about their first visual thinking experience"

4 HCY: Show user's progress

How can you show people the progress they have made with learning VT?

Rewritten into:

"How can you show people the progress they have made for visual thinking?"

5 HCY: Involve user's work context

How can you involve people's work (context) into simple visual thinking assignments?

Rewritten into:

"How can you make the new product relevant to user's work?"

6 HCY: Use VT at work

How can you make people use the visual thinking product in their daily work/life?

Rewritten into:

"How can you make people use the visual thinking skills in their work?"

Resulting principles for design from the brainwriting session

All the sheets of each HCY questions were collected and reviewed in order to get to directions for solutions. For each HCY question, the ideas were reviewed. From each sheet, the overlapping ideas were clustered and the main principles behind them.

Out of these principles 14 were chosen to be incorporated into the concept design as they fit the interaction vision and design goal.

A table with the full evaluation and ranking of the generated ideas can be found in the appendix.

6.2 Concept Iteration 1

The first concept iteration was named 'Paper Plane', this later became the name for the final design. The concept was based on a straightforward translation of the visual thinking workshop material to presentation slides. The main goal of this concept was to 'trick' users into drawing, by drawing letters first (close to user's current abilities), and then transform them into drawings. secondary goal was to introduce visual thinking. By browsing through the slides users first got an introduction to visual thinking. Then simple courses featuring text and images followed. Video was not included.

The concept prototype can be viewed online at: http://slides.com/the_rds/prototype1slides#/

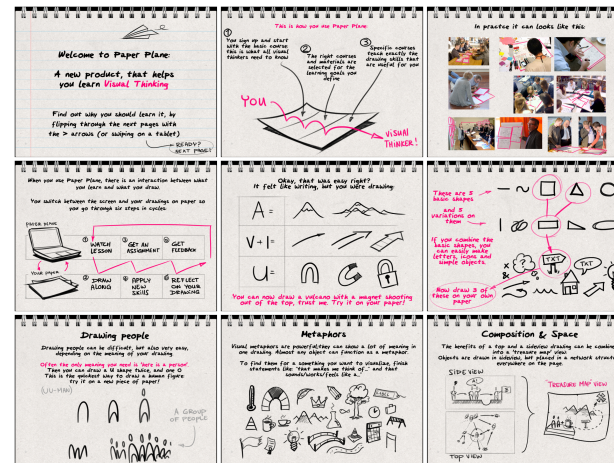


figure 6.1: A selection of screens from the digital concept iteration 1 prototype 'Paper Plane'.

The concept was tested with two users to test the autonomy of users, the visual style and t



figure 6.2: A selection of screens from the digital concept iteration 1 prototype

6.3 Concept Iteration 2

The idea behind this concept is that users get started with visual thinking right away, without going through an introductory course. This approach is based on fighting many users' notion that visual thinking is only based on the skill of drawing. They see learning how to draw as a barrier to start visual thinking,

While VT relies on two other skills that users usually already possess or at least are familiar with: VT is not only about drawing. See figure 6.3

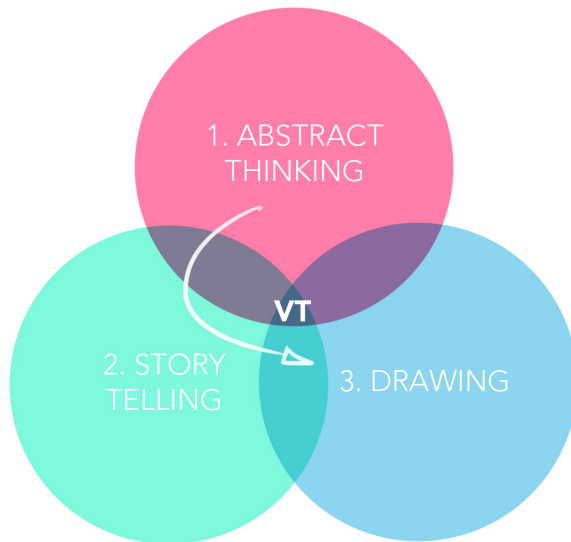


figure 6.3: The three combined make VT: Abstract Thinking, Storytelling (Structuring) and Drawing.

This concept makes use of this by letting users start with a familiar skill: communication by using words, and step-by-step transform these into drawings, and finally a complete story.

For the concept a digital application on a tablet is chosen. The functionalities of a tablet include a capacitive touch screen which is suitable for drawing. A digital platform allows interactive content such as animations, and an internet connection creates the possibility of connecting to a product database. The application is meant for people within companies to use when they want to communicate a story that they want to

Features

The concept design has three main features: drawing (drawing a visual story in a structured way), sharing (communicating a visual story) and getting inspired. These features can all be accessed from the main page; where the user arrives when the application is started up.

Draw

With the drawing feature the user can directly start with visualising any story they want to communicate to others. They do this by going through four steps: The first is writing their story down in a few sentences. The second step is to highlight the important keywords from these sentences.

The third step is that the product associates words from the user's keywords in the form of a mind map. If the keyword can not directly be visualised the related words suggested by the application, based on other users' related word associations can make this easier: a form of peer-to-peer learning.

The related words can be selected to reveal a drawing that someone else using the app has made for that word. From having transformed all keywords into drawings, it is now easier to make the fourth step: combining all drawn keywords into a single drawing with a structure connecting all of them.

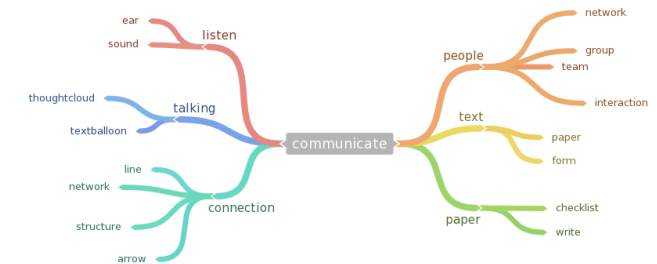


figure 6.4: An example of a word-association-cloud that would be generated by the application. Any of the words can be selected to make new associations or see a drawn representation of it.

Share

After a visual story has been made it can be digitally communicated and shared with anyone else by recording the movements of your fingers or pen on the screen in combination with your voice explaining the story. As soon as you touch/let go the screen it starts/stops recording sound and movement respectively. This interaction is the digital version of presenting a drawing you made on paper by holding it up for others to see and pointing to parts of the story while explaining them by talking in a simple digital movie format. In a work context you can easily share it directly with your colleagues if they are in your team. Sharing and drawing can also include teamwork and discussion around one drawing with several users at the same time.

Get inspired

From the landing page users can access a gallery in the application where the user can see his drawings and those of others according to the keywords used for it. This is how peer-to-peer learning is incorporated in the concept.

Product information structure

Below is a flowchart that visualises the structure of the product, it's screens and the connections between them. At each screen the user is able to go back to the landing screen with a home buttoning

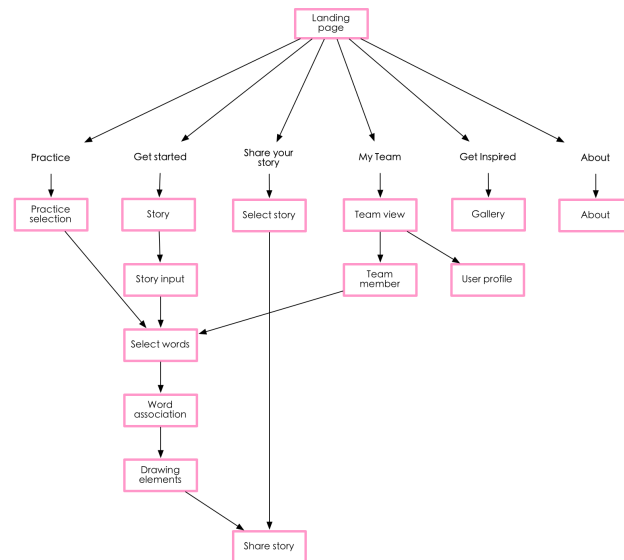


figure 6.5: The information structure of concept iteration 2 'Visuals Talk', showing all screens the user can access

Testing the Visual Story Tool

In order to test product interactions, user tests were set up for testing the interaction between a digital e-learning website and user drawing on paper. The purpose of the test was to find if the user understood what the user experience would be if the product simply enabled people to do a drawing assignment. The current VT workshop materials were used to teach, and a paper prototype

For the test a digital prototype was made for boy laptop and tablet. It simulates slides of the content from the original VT workshops. The participants did this test by themselves, without help.

The full test and results can be found in the appendix.



figure 6.6: An impression of the paper-prototype user tests for the concept iteration 2.

Using abstract thinking in the concept:

Through selecting keywords, thinking about importance and imagining and choosing the right concepts in combination with their keywords.

Using communication in the concept:

Through explaining and sharing the drawing afterwards, by pointing and talking about their drawing with others. What happens during the first experiences with visual thinking is that the user goes through the first two to three steps of the four steps of learning/acquiring a new skill, in order. See figure 6.7.

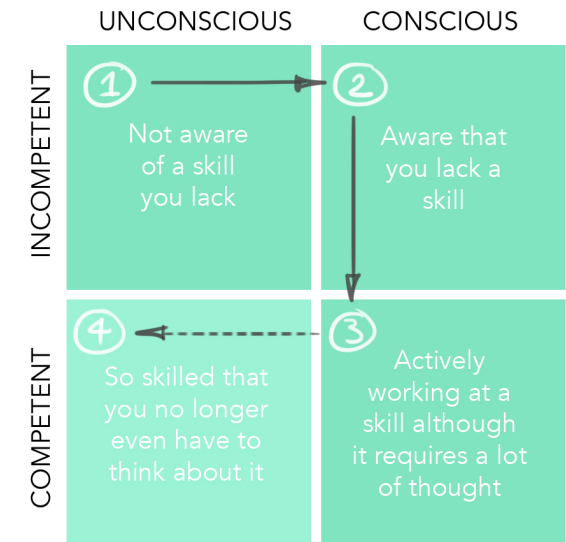


figure 6.7: the intended movement of the user from unconsciously incompetent to consciously incompetent.

The fourth step will likely not be achieved by the new product design; this is outside of the scope of this project.

7. FINAL DESIGN

The 'Visuals Talk' concept of iteration 2 showed a positive interaction, between an e-learning environment and users drawing on both a tablet and paper.

In the final design, the concept of Visuals Talk is integrated in the new design as the 'Story Tool'. The focus of the final design is on learning through short courses in a new interactive way.

The final design is named **PaperPlane**, referring to both an airplane and a platform made of paper. The final product is also a web platform, with a heavily stylised white- and transparent paper appearance.

7.1 Principles

The final design is the result of all the changes and choices made during the design iterations. The principles that are now in the now make up the final design are the core o

User Control

Giving users control over the learning process while maintaining a guided learning process that helps users learn. The control comes from the non-linear selection of courses after finishing the basic course and having full navigation controls on all pages.

The guidance comes from the structure of breaking down the visual thinking skill set into Abstraction, Storytelling (structuring) and Drawing and learning/reflecting on these one after the other.

Allowing the user to be in control also lets the users adapt to the right difficulty by themselves. Users are never forced to have to finish a course or difficulty level, except for when they are ready and want to. This does place a higher

responsibility on the user. As adult learners however, this type of learning with responsibility actually fits them.

Peer Learning

Peer learning is an aspect of Kolb's ELM model (reflection), but in the final product it is more than that. With the user's peers in the community a form of social learning takes place where users look at their skill and results in the past present and future, but also compare to others in a positive (even anonymous) way.

Progress indication & Gamification

Visually showing the user's progress and ranking in terms of difficulty levels achieved, creates a game effect. Where users can see the next goal just within reach, they put more effort into the product. This feature is on the dashboard and 'my page'.

Experiential learning through Kolb model

Users go through a complete learning process. Not only do they learn from the instructions given in the course's video modules, but also in the three following steps: practicing during the video modules, application of skill during the assignment, and reflection during the self- and community review. This learning at every step-principle is realised by incorporating the learning styles from the ELM model by D.Kolb into the product structure.

Provide tools for visualising without lessons

Users can learn visual thinking with the product through the courses, but can use the Story Tool and Visual Library at any given time, even without doing any courses. This helps users to apply their visual thinking skills in practice, where they have to apply skills instead of learning them.7.2 Structure & Interaction

The structure of the platform is centred around the content: it can be multimedia, but is mostly very short videos with a voiceover, of 10-120 seconds that are each a mini lesson, and can be viewed separately. The videos (or modules) are linked together to form a course about a certain topic. A course consists of 2-20 video modules.

The videos are displayed on the video page. Here users can: control the video, link to other related videos on the platform to learn more about a specific topic, and do exercises connected to each video. This networked-linking is an important feature of the design: it allows users to choose their own non-linear path through the product. This creates the feeling of control, while the structure of learning is still guiding the user.

After all videos and exercises are done, the course is completed with doing a final assignment, a test for the user to apply their newly gained knowledge.

The drawings of the exercises and the assignment are uploaded, and shared by all users to learn from in a peer-to-peer structure

Users select courses from the Dashboard page. This page gives an overview of the user's progress through all the courses and provides a course selection list & course search.

On the homepage users sign up for an account and log in. They can view their own uploaded drawings on their account named My Page.

From the header menu visible on every page, the Dashboard, Story Tool, My Page and Visual Library can all be reached.

- On the Dashboard courses are selected and progress shown
- On the Course Module pages multimedia content (mainly video+audio) is shown and links to other
- On the Assignment page the learnt material is
- On the Review pages users reflect on their work and thereby their learning process and that of others.
- In the Story Tool users are guided through 6 steps to help them make a written story visual, similar to the structure learnt in the courses and assignments.
- In the Visual Library users can (re)view other users' drawings and find templates for entire objects or simply for drawing objects.
- On My Page users can view their statistics, all past and future activities in Paper Plane.

Interactive Prototype

The prototype of this design proposal is viewable and clickable online, at www.roberts87.wix.com/paperplane

Appearance & Style & Usecases

The style of the design is subdued, light and bright. This is done so that the drawings featured on the website get the attention, while the product stays in the background. The actual background is a blurred image, creating a sense of depth, and lets all other elements, like the drawings or the video content to come to the front.

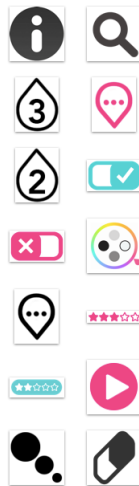


figure 7.1: A selection of icons, colours and buttons from the final design, displaying the visual identity through colour and shape.

The lightness of the design allows bright magenta buttons to stand out and act as a usecue. Anything that can be interacted with is saturated magenta or saturated blue-green. These are the theme colours for the design. unclickable buttons are low-saturated or grey. Simple icons are use throughout the product, to minimise the amount of text visible, as the focus of the design should be on graphics and drawings.

Small triangle shapes show the order with which the user should navigate through the design by pointing. These cues do not obstruct the user in any way.

Structure of PaperPlane

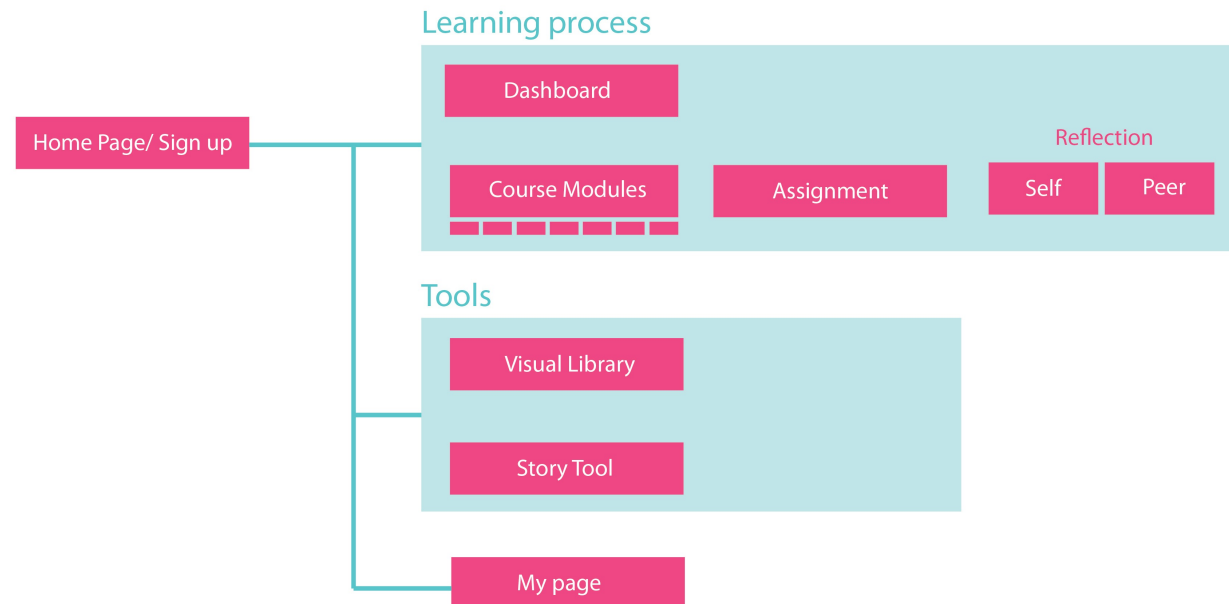


figure 7.2: A hierarchical visualisation of the final design's structure.

Product Impression

The images on this page (figure 7.3-7.5) give an impression of the context and environment the product will be used in. It is suited for both desktop and laptop computers and tablets.



figure 7.3: A typical context and environment in which the product is used. On a tablet, at a desk, with either pen and paper or the touchscreen to draw on.



figure 7.4: Behind a laptop, paper can be used to draw on at a desk and the built in-webcam for uploading pictures of the drawings.



figure 7.5: On a digital tablet with touchscreen, users can draw and interact directly in the website.

7.3 Screens & Features

On the next pages each feature of the product is explained per each webpage of the product.

The Home page (Signup & Login)

Call to action

The user is encouraged to create an account and start right away.
The fingerprint background on the round button suggest a touchscreen interface and users already start associating the round shape with interactive elements from this page on.

Explanation

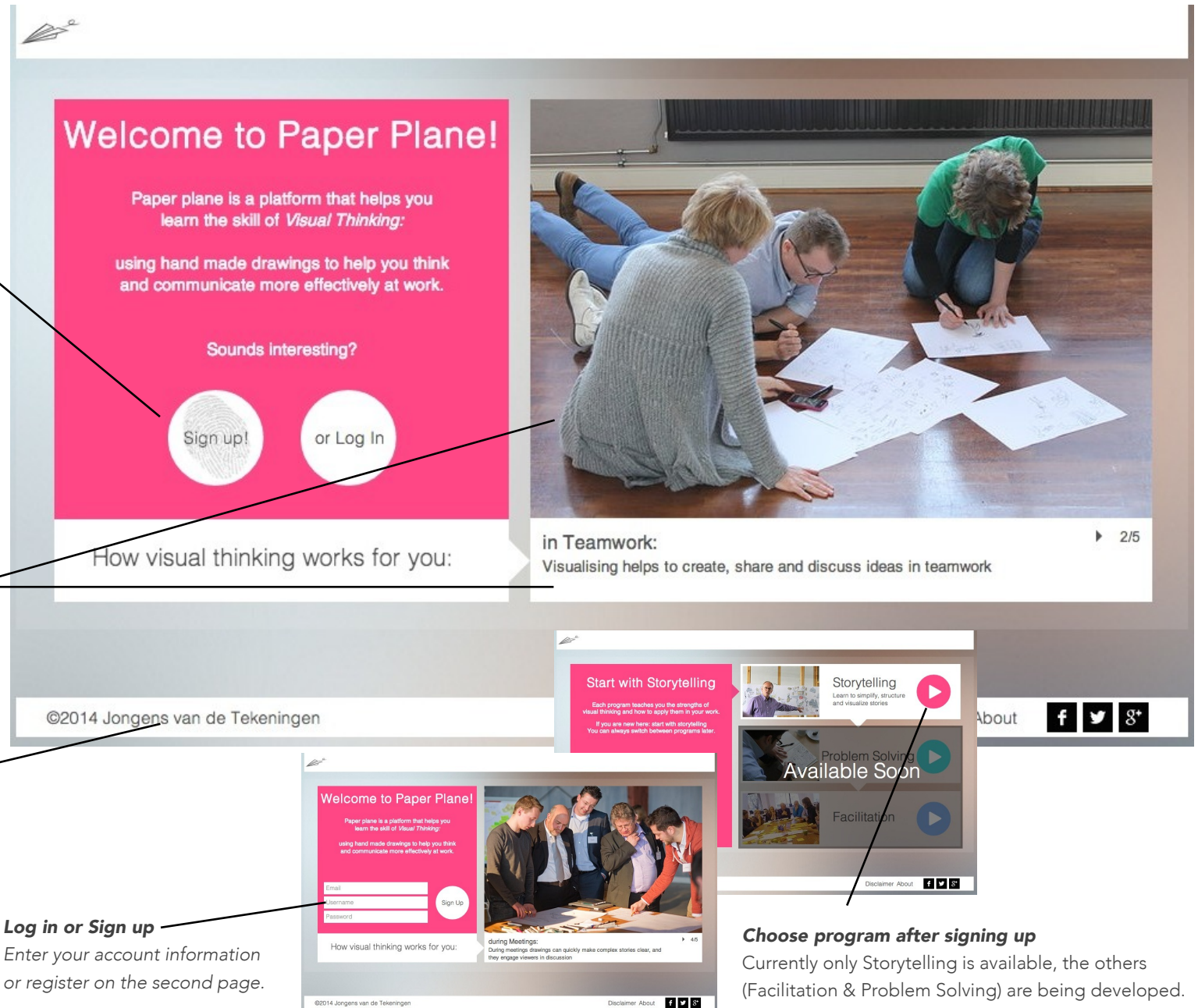
On the homepage new users can get an idea of what visual thinking is and in what situations it can be used. Through the carroussel-images and accompanying text.

Footer

The footer is visible on every page and gives access to social media, legal notices and information about the JvdT

Log in or Sign up

Enter your account information or register on the second page.



Choose program after signing up

Currently only Storytelling is available, the others (Facilitation & Problem Solving) are being developed.

The Dashboard page

Header menu

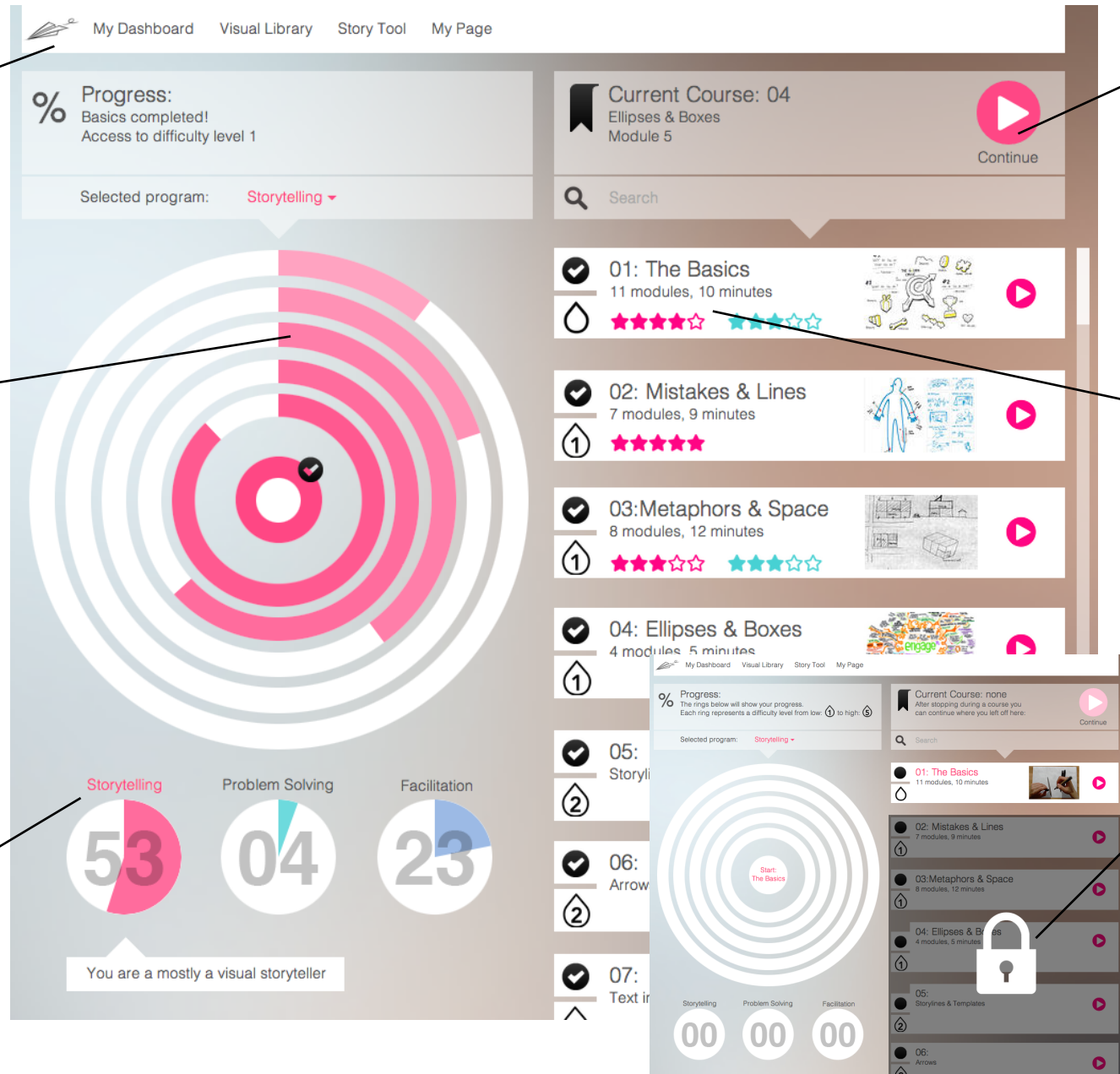
The top menu bar is visible on every page of the website. It links to the Dashboard, the Story Tool, Visual Library and My Page.

Progress Overview

On the dashboard users quickly can view their progress in the levels (rings) representing difficulty levels. The rings' fill colour shows how many modules per difficulty level have been completed. The rings show a 'linear' (fixed) start in the center but allow a non-linear road through the content in later rings.

See your style

The user can see in which of the three programs he or she is most proficient. Clicking changes the program and thus the courses on the right side of the screen.



Quick continue

From this feature at the top they can quickly continue where they left off during the last stopped video: Users have direct control over the pace of learning i.e. when they start and stop.

Course Info & Selection

All courses for this program are displayed here, ordered by difficulty level. Information is displayed about completion, duration, difficulty and self/peer rating of the course.

Unlocking

Difficulty levels and courses get unlocked in a sequence, not all courses are available at the same time. e.g: after 4/7 courses of difficulty level 3, you can go to level 4

The Course Module pages

Grouped interface

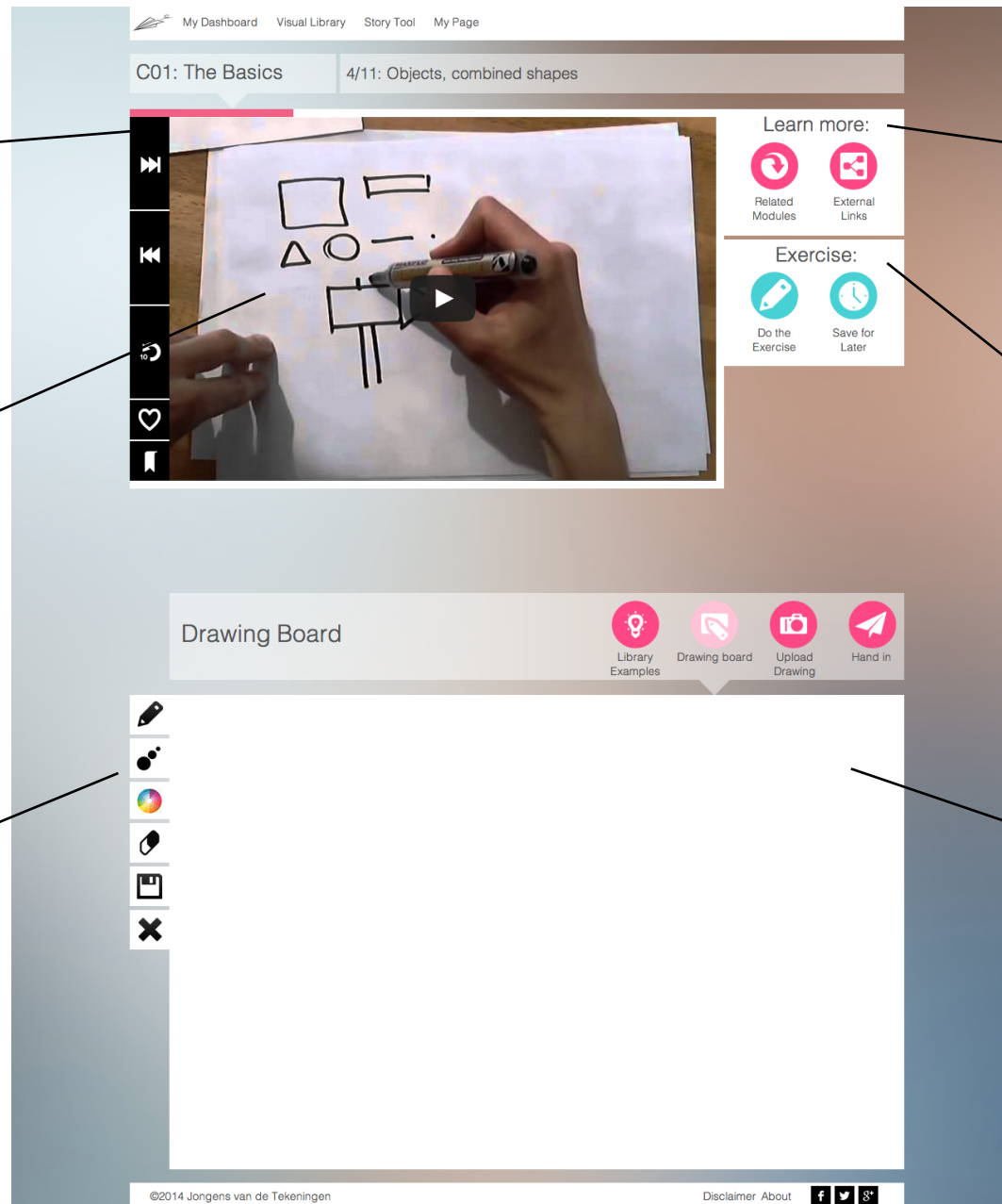
Controls are important, and grouped together in black on the left. Accessible, but not obtrusive

Large Video

The visuals (video) is most important, and is the largest feature on the page. The controls are easy to access and nothing of the course content is hidden from the viewer

Tabbed icons

To not show too much unwanted information on the screen, it is hidden behind clickable icons. Small white tabs suggest a stylised paper interface.



Learn more

It is easy for users to link to related video modules for deeper learning, or external links related to this video

Exercise

For every module there is an exercise, which will start the explanation video in the main video window. Users can save it for later, or see other users' work to learn from.

Drawing board

On a tablet you can directly draw on the page of the video module, to do exercises just below the video is a drawing board

Assignment page

Brightness shows importance

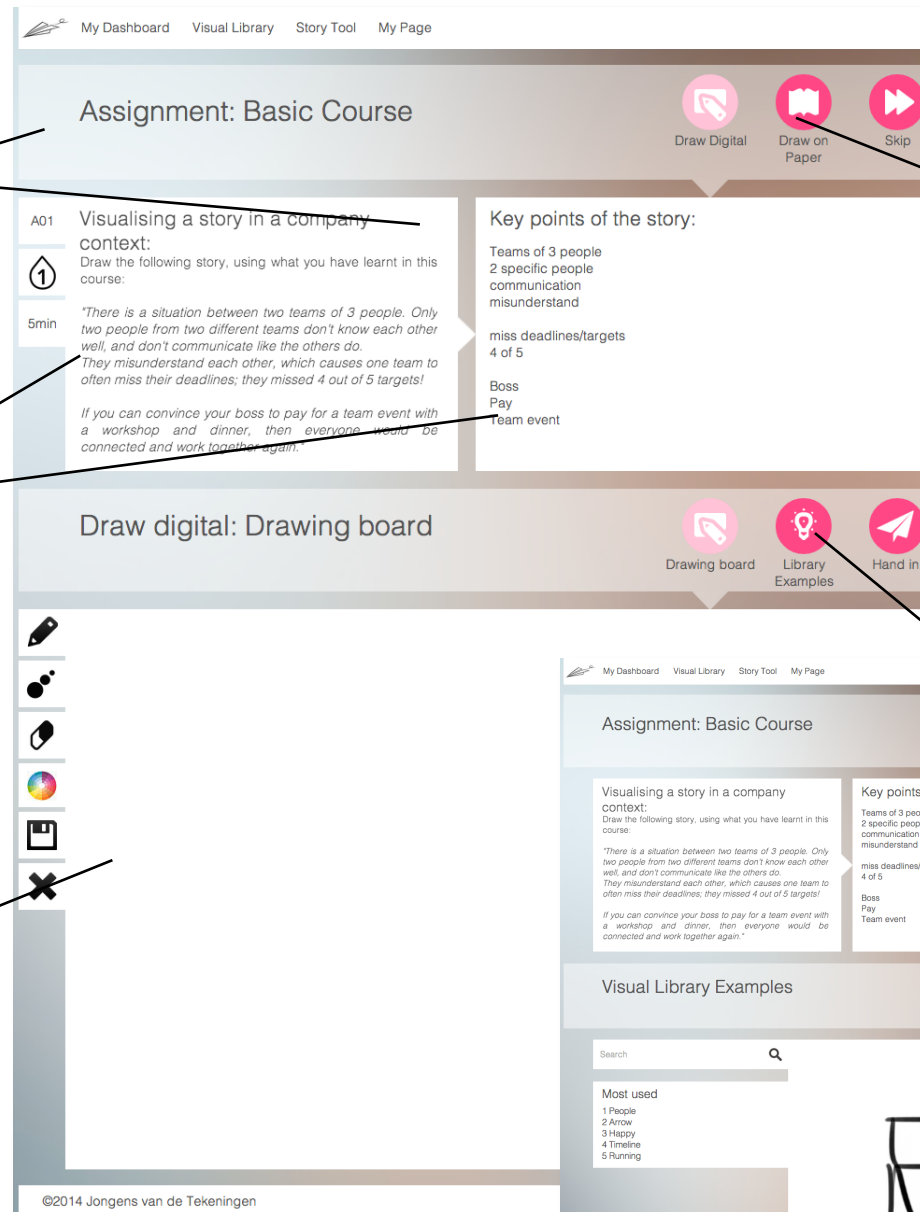
Transparent elements are only providing navigation or a framework for the page. Bright white elements contain the content

Visualising a Story

The assignment is now to visualise a story within a company context. As an aid, the keywords have already been summarised on the right

A drawing board

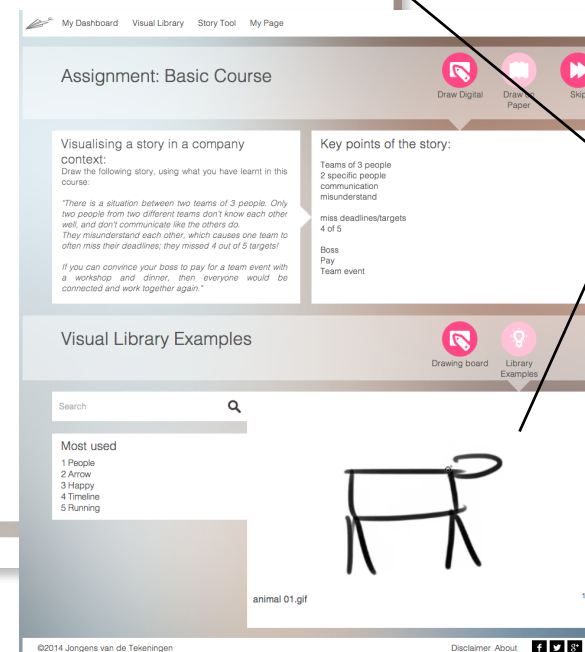
To visualise the story when you work on a tablet or iPad.

**Choose your medium**

You can draw digitally with a tablet or iPad. If you prefer analog drawing, click to switch to drawing on paper. The site will display visual examples or inspiration instead

Example functionality

With the click of a button you can switch from drawing board to showing animated visual examples, like those in the visual library page.



Self Reflection & Community Review pages

Self Reflection in 3 steps

Reflect on your own drawing with the help of the questions and the y/n sliders in 3 steps, following the five yourself a rating and finally a go/no go for this drawing assignment.

The interface shows a 'Self Reflection' screen with three questions and a star rating. The questions are: 'Are (all) the key points or keywords of the story (the elements) translated into drawings?' (checked), 'Are any elements added or left out for a good reason?' (checked), and 'Are all story elements clear in the drawing? Is the most important one visible as such?' (unchecked). The star rating is 4 out of 5. The screen also shows a drawing of two people at a table with a thought bubble above them.

Self & Self rating

Here the user can see his own drawing assignment result, self rating and rating by the community. Profile images and names can be set to anonymous on 'My Page'.

The 'Give Rating' interface shows a star rating of 4 out of 5. Below the stars are social media icons for Facebook, Twitter, and Google+.

Give&Take

Giving a rating means you will get ratings yourself too. These are done based on the same questions as the Self Reflection

Comment & review peers

Drag comments to the exact spot you want to annotate on a drawing from someone in the PaperPlane community.

The 'Community Review' interface shows a drawing of two people at a table with a thought bubble above them. Below the drawing is a 'Get Rating' section with a star rating of 4 out of 5. To the right is a 'Comment' section with a text input field and a 'Comment' button. The interface also shows a 'Community Review' header with 'Done!' and 'Skip' buttons.

My Page (Account Settings)**Anonymity on/off**

With a switch, the user's name and picture are (un-) shared with the community. Anonymity can help users to share their drawings with the community, increasing feedback and peer-to-peer learning

Exercises

For every module there is an exercise, which will start the explanation video in the main video window. Users can save it for later, or see other users' work to learn from.

User Gallery & Favourites

The account page shows all the drawings the user has made, but also those of others, allowing to find, compare and comment on drawings

The screenshot displays the 'My Page' interface with the following sections:

- Navigation Bar:** My Dashboard, Visual Library, Story Tool, **My Page**
- My Progress:** View your statistics and progress so far.

Uploads	43	Modules	21/79
Time Spent	22	Exercises	17/79
Comments	12	Courses	05/24
Reviews	09		
- User Profile:** Mark van Hoven. Below the name is a toggle switch for 'Show your name and avatar in community?' which is currently turned off.
- My Activities:** View your upcoming and past activities on PaperPlane.
 - Tabs: Saved Exercises, My Gallery, My Reviews, Favourites.
 - Search bar and sort dropdown (Newest first).
 - Grid of drawing thumbnails: Materials.png, Basics.png, Basics Changed.png, Story.png, Metaphors.png, Grouping Surface.png, Basics Combination.png, People.png, People Groups.png, Arrows.png.

Personal statistics

All data on the user on the website can be tracked, and shown to the user, documenting his/her progress. This is a gamification principle and provides the user with a sense of control and motivation to progress.

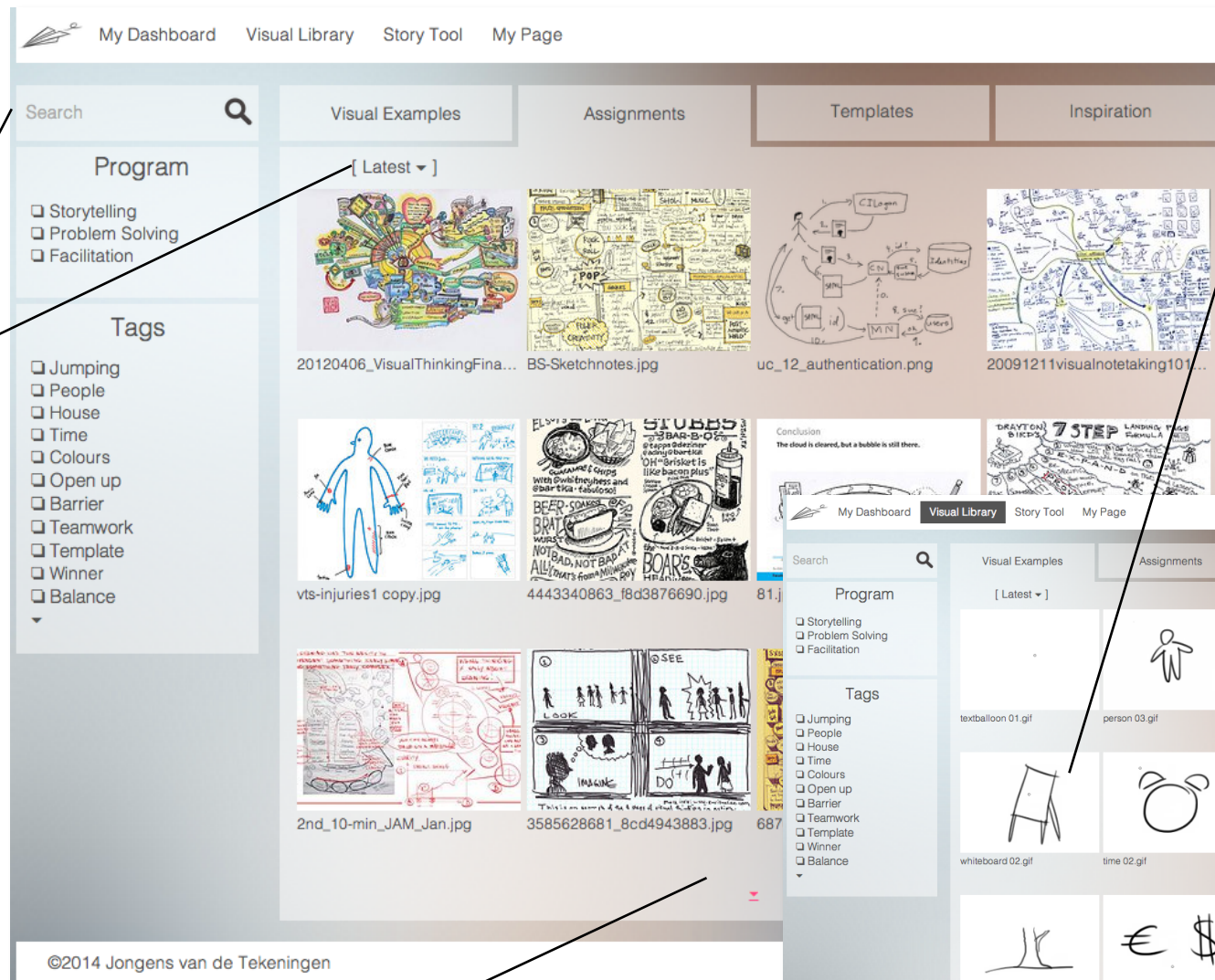
Reviews from, and by you

Users can comment on each others work, enabling a form of peer-to-peer learning, by directly placing notes on the right parts of the drawings

Visual Library

Find, Filter & Search

The library can be a quick reference tool, so that people can find the example, inspiration or template they need and get back to drawing, anytime.

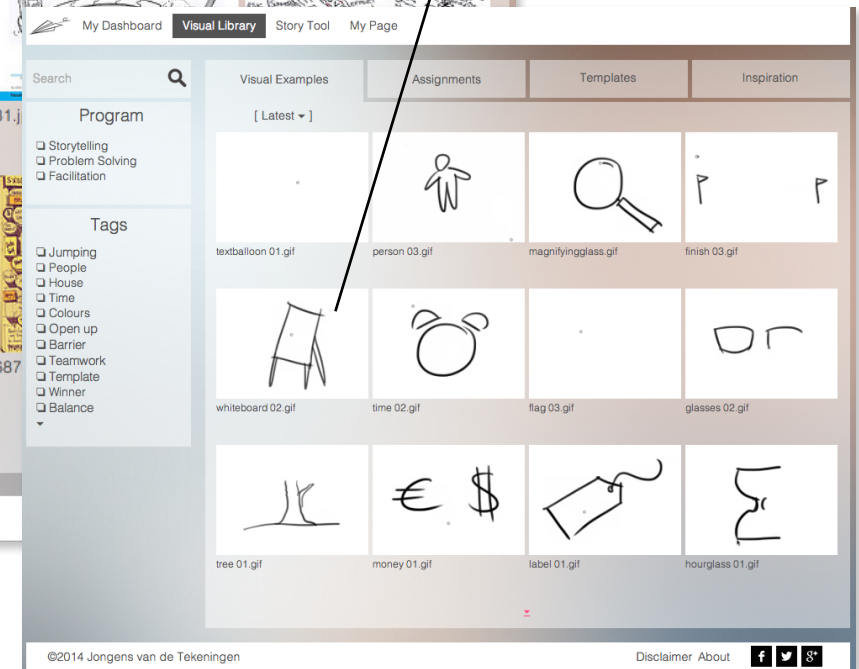


Movement

The drawings displayed here are be animated, so it is possible to see the exact steps needed to draw, to make it easy to start copying and using them

Just browse

Users can also just browse the library of drawings, to find something interesting or for inspiration.

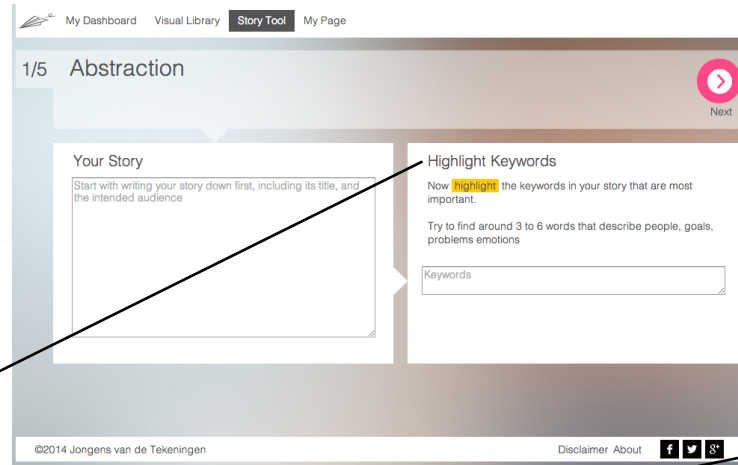


The Story Tool, Steps 1-3

Abstraction 1

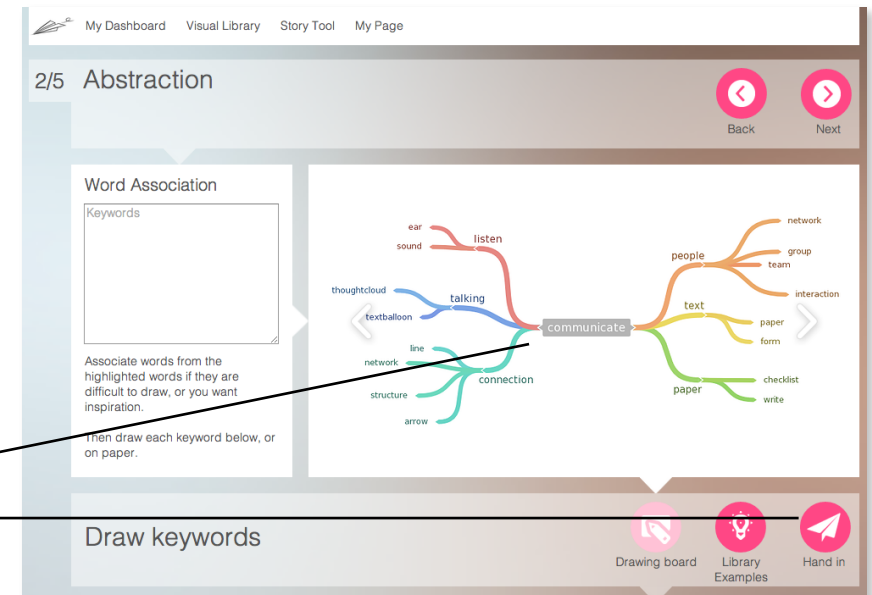
The structure and functionality of the story tool is similar to the assignments the user does at the end of a course. Now, however, is the story completely made by the user's own context.

The first step is to write your story down and highlight the keywords from it. This is abstraction



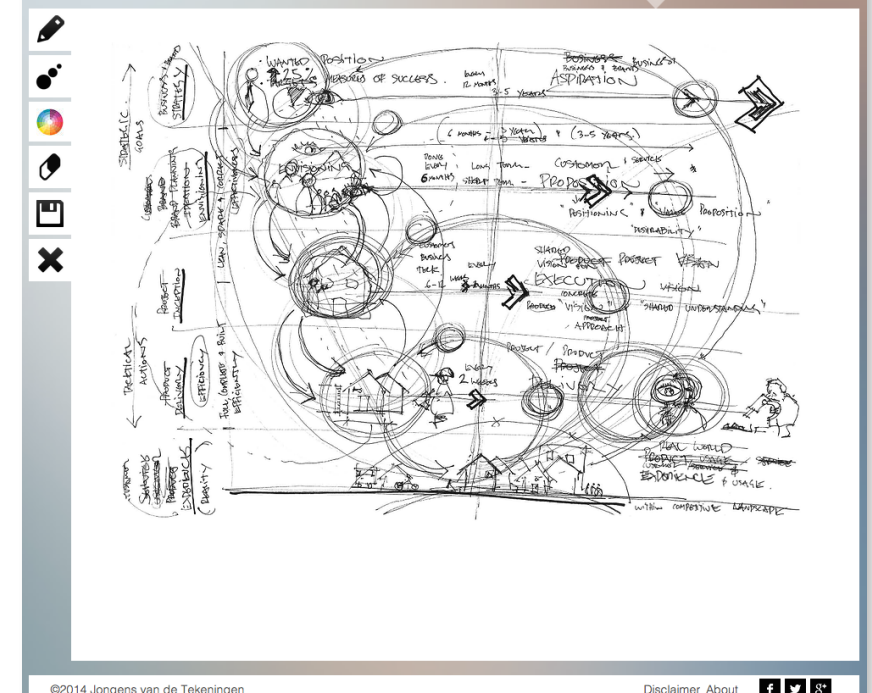
Abstraction 2

From the keywords/key elements of the story word associations can be made in the word association tool. Associated words can be easier to visualise. All elements are visualised below on the drawing board or photo's of analog drawings uploaded.



Structuring

When all elements are visualised, the structure has to be added. This means connections, arrows, metaphors, a sequence or any other format that explains the story best. In this step a template can be chosen to help as inspiration or as an actual template.



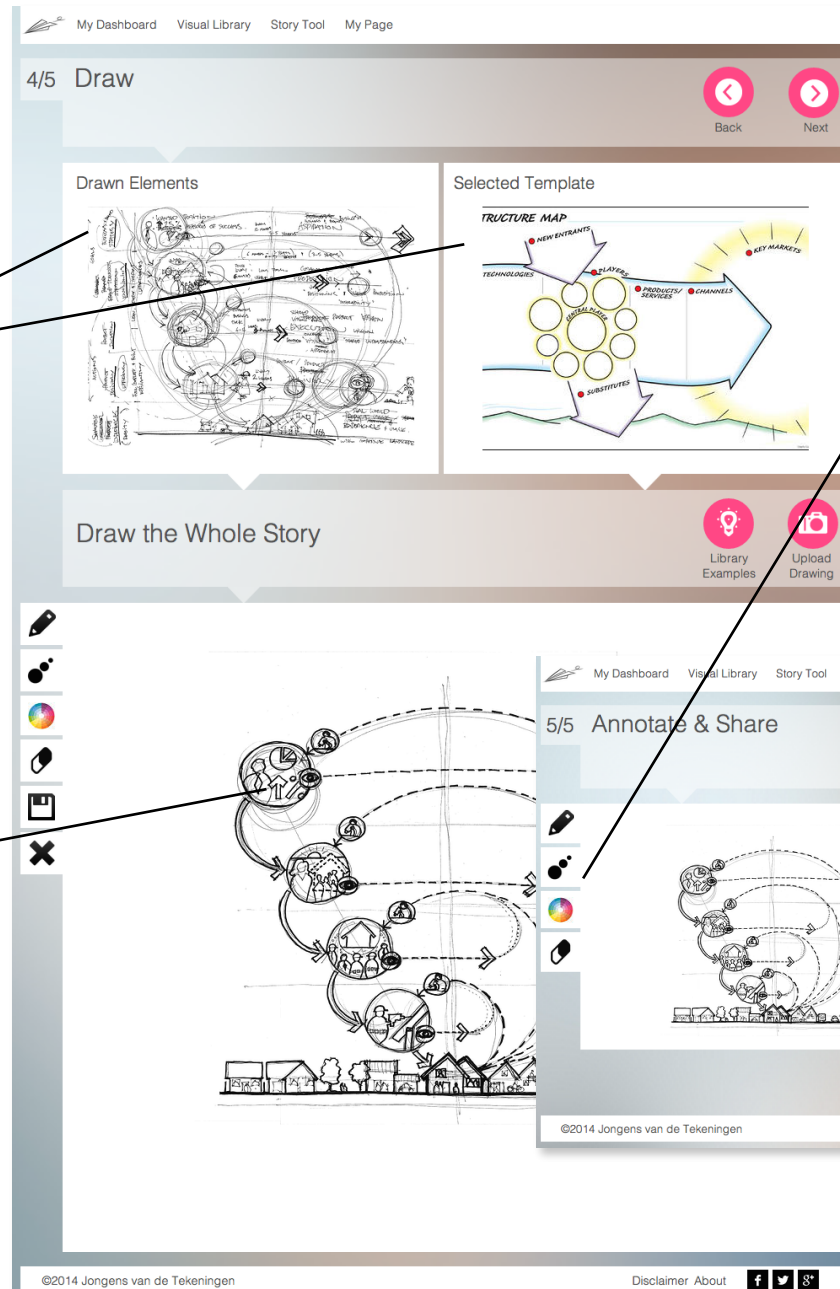
The Story Tool, Steps 4-5

Element sketches & Template

The separately drawn elements with the selected template are shown together. The user can now draw the combination of them on paper or digitally with a tablet.

Draw!

If all the elements of the story are drawn, and a template selected, the final drawing can be made. Based on the original sketches of all elements.



Share

This is the equivalent of a presentation: here you communicate your work. Add annotations/ remarks to your drawing, and send it to someone using their email or PaperPlane account name.

EVALUATION

8. EVALUATION

For the evaluation of the final design, user tests were carried out with three participants. Each test was a 1hour test, consisting of the test itself and an interview afterwards. function. The test goal was to find out how well the design goal is addressed by the design.

The complete test setup, questions can be found in the appendix.

8.1 User Experience Test

Method

Test goal: test the design's user experience of the product interaction with an interactive prototype, in order to answer the test questions and design goal.

To a smaller extent, the usability of the design: its efficiency, effectiveness, ease-of-use of the product:

Can the design and use cues guide the participant through the intended learning process?

The participant will be given a few tasks to perform on different pages of the website prototype. The tasks are in an order so that all pages of the website are visited. The tasks are goal oriented, but still allow the participant explore and navigate the prototype by themselves. Not all buttons and features of the website are functional, and some are replaced with a paper-alternative. This will be indicated to participants only when needed.

At the start of the test, participants are asked to use a 'state of mind'. To help imagine as if they are in a real-world scenario using the product.

Users are asked to 'think aloud' during the whole test in addition to observations.

The participants' interactions and movements on the website are recorded with screencapturing software, that records audio, video of the screen and video of the participant him/herself. This material is used to analyse the user experience.

The participants were asked to speak their mind out loud the entire test. The designer/facilitator observed, and took notes of the participant's interaction with the design prototype. At the end of the test, an interview was performed to get more detailed feedback on the entire design and the user experience.

As exercises during the course modules the participants were asked to draw along with the video. As assignment the story of concept iteration 2 was used. This story features a company context, which fits the

Participants

The three participants are all target users: professionals in business. The participants are all employees, between 23 and 35, with no prior visual thinking experience.

Main test questions:

- To what extent does the design fulfil the design goal?
- Does the design realise the intended interaction vision for the user?
- Do the users feel guided on the website, but in control at the same time?
- Do users learn visual thinking through this product/method, and can they apply it in a work-context-related scenario?



figure 8.1: Photos of the user tests of the final design.

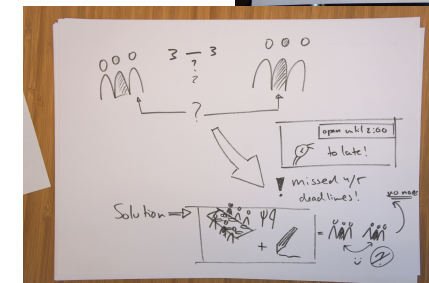
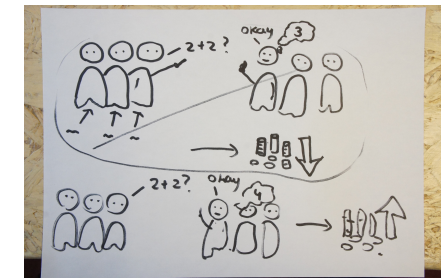


figure 8.2: Drawings made during the final design's user test.

Main Results Summary

Negative:

- All participants commented on the small size of the clickable start/play buttons. Especially in the the video modules.
- The bookmark icon in the video player was not clear to 2/3 participants, who looked for an 'end button'.
- The size of images was mentioned by 2/3 participants; with the comment that every image could be displayed larger on the screen.
- The colour coding of the user and community ratings with the colour of the progress rings on the dashboard was mixed up by 3/3 participants
- More 'feedforward' was expected by 1/3 participants, for example where the 'external links' button in the video modules would lead to.
- On the assignment page the choice between the paper-or-digital buttons was not obvious to all participants, and was skipped at first.
- An automatic save function for progress made during the course was expected by 2/3 participants.
- The lack of (visual) feedback for navigation when linking from one video module to another, to another.
- 3/3 users stated they would not make a website profile by adding their own name or picture if it is not necessary.
- The option for anonymity of name and avatar was appreciated by only 1/3.
- The annotation function in the Story Tool was deemed unnecessary by 1/3
- The time limit on the drawing assignment was not noticed by 3/3 participants.

Positive:

- The comparison between the comparison is observed to be useful. 2/3 Participants noticed useful techniques or tricks displayed in another drawing. One of these participants actually said that the comparison with you own drawing was unnecessary
- Learning through audio is noted as helpful by 1/3 participants
- The animated examples drawings (animated .gif files) were appreciated by 3/3 participants
- The drawing content was found fun by 2/3 participants, and judged as a good start of learning visual thinking. It was not deemed too easy by 3/3.
- The small steps size between drawings in progress are appreciated by 1/3 of participants.
- All users felt in control during the

8.2 Conclusions

From the tests can be learnt that every participant will look at the product differently, and have different perspectives. The same questions were asked to the participants during the interview

Does the design realise the intended interaction vision for the user?

Half.

All participants were drawing and sharing their drawing intuitively like children would, even though one participant seemed initially hesitant and slow to draw.

The feeling of mastery was absent for all 3 participants, likely because the assignment wasn't challenging enough. All participants responded they would like to continue with the next course, and did feel

Do the users feel guided on the website, but in control at the same time?

Yes.

3 Out of 3 participants reported they felt in control of the learning process. The participants did not particularly feel guided, but they did feel welcomed by the design and the currently easy content.

Do users learn visual thinking through this product/method, does it enable them to apply it in a work-context-related scenario?

Yes,

If the assignment is regarded as a work-context related scenario, then the course has enabled the design enabled them to draw a story of the the drawings

8.3 Recommendations

Repeat use

To further the design it is recommended to test the design more, and also more repeatedly with people from the target group. Repeat use is not tested, and neither is the effect of more difficult courses.

To directly implement:

- Create bigger control buttons for the VideoModules
- Removing unnecessary pages from the design.
- Sales of the product only after users have already done the first few models or courses.
- If skipping input is possible, users will do it. Make skipping either impossible or not a problem for the functioning of the design.
- <ake the most often used controls and elements bigger, and better clickable to improve the flow on the website.

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APPENDIX

Overview of Current Products

Current learning methods	Loc. Restr.	Time Restr.	Live	Scale	Inter-action	Multi-media	Mat-erials	Costs, purchase	Application, Admission	Feedback on progress	Accredi-tation	Other characteristics
Formal education, courses	yes	yes	yes	large ±300p	high	yes	provided + acquire yourself	high	yes	partially	yes, official	traditional, structured
Workshops and seminars	yes	yes	yes	medium 2-50p	high	yes	provided	high	yes	no	yes	small timeframe, no real-life situation practice, 1 of 2 most common products
Internships, traineeships	yes	yes	yes	small 1p	high	yes	provided	none	yes	no	sometimes	learning is done in real-life situations: directly applied, unstructured
Lectures	yes	yes	yes	medium 2-50p	limited	possible	acquire yourself	none	none	no	no	traditional, structured
Video	no	no	possible	unlimited	limited	possible	acquire yourself	none	none	no	no	motion over time: see the order of construction (visible emergence)
Books, literature	no	no	no	unlimited	none	no	acquire yourself	medium	none	no	no	static, potentially large reach, scalable product, 1 of 2 most common products
Audio(books), podcasts	no	no	possible	unlimited	none	no	acquire yourself	none	none	no	no	hands- & eye-free information exchange
(serious-) Games	no	no	possible	unlimited	high	yes	acquire yourself	none	none	possible	no	open to digital crowdsourcing
webpages, open courseware	no	no	possible	unlimited	high	yes	acquire yourself	none	none	yes	sometimes	open to digital crowdsourcing
Social networks (digital, online)	no	no	possible	unlimited	high	yes	acquire yourself	none	none	no	no	open to digital crowdsourcing
Social networks (real world)	no	no	possible	unlimited	high	yes	acquire yourself	none	none	no	no	unstructured
Autodidacticism	no	no	possible	1p	limited	yes	acquire yourself	none	none	no	no	no guarantee, unstructured, slow, no coaching

User Research

Interview Questions

1. On current communication:

- with who do you communicate?
- what are your core communication activities?
- in what situations do you communicate (places, activities, contexts)
- with what tools do you currently communicate?
- where do you communicate? (locations, rooms)
- how long do you communicate (durations, in minutes)
- what is positive/negative about your current communication

2. On current drawing activities:

- do you currently use drawing for communication (y/n)
- if yes: in what situations
- did you previously learn about using drawings to communicate?
- how often do you use drawings (everyday, # per week/month)
- what kinds of drawings do you make/use
- when do/don't you use drawings
- if no: what are the barriers to use drawings
- what are the barriers to learn more

3. What if you could learn to use drawing to communicate through a new product:

- where would you like prefer to learn through this product (home/work/elsewhere)
- on what medium would you like to learn this (analog paper/digital)
- would you be willing to put effort into learning with such a product (y/n)
- how often/how long would you be willing to use this product (# a week, hours)
- would you be willing to pay for such a product (at all, estimate)
- what do you expect to be the benefits of the product
- what are your main concerns/worries with such a product
- would you like this product to be personalised/adjusted to you

User Research Interviews: Key Insights & Quotes

Interview: Jiaji Zhao

Product developer at Nightbalance, a YesDelft healthcare-product design company.

1. On current communication:

He communicates with everyone in the company and states that **"communication is important for a small company"**. All employees work in a one-room office, without separating walls, and communication takes place there, behind computers, and in a meeting room next to the office. Core communication is through email (without drawings attached), second is face-to-face talking at each others' desks. Group discussions of about 1-2hrs are held, and 1-on-1 communication between 0-5 minutes at employees' desks is common. Communication takes place throughout all work activities, notable are powerpoint presentations by one person to the complete team of 12 people, to update each other on their work.

2. On current drawing activities:

Drawings are used for communication, since **"you can show a logical order by drawings"**, **"drawing speeds up understanding"** and **"text plus drawings is an efficient combination"**. **"Drawings are more direct"** than writing, and **"drawing is easier if you want to tell a story or explain something, especially relationships"** Group discussions of about 1-2hrs are prepared and held but less than half of them feature drawings. 1-On-1 communication between 0-5 minutes at employees' desks is common, and more than 50% of these feature drawings of some kind

(around 70% estimated). They are made on small separate pieces of paper or post-its. Drawings are sometimes used to communicate across language barriers (Chinese/English/Dutch). A personal notebook is kept with writing and drawings in it, but is not used for communication to other employees. Body language is deemed visual communication too. Drawings are not always efficient; sometimes one idea can only be explained in different drawings, which do not all work. This means some drawings of the same idea are made 2-3 times before they communicate effectively. Barriers for using drawings are the awareness of being able to use drawings at work: "I didn't know of the opportunity", and not knowing basic shapes makes it difficult to start. **"Drawings show your professionalism"** Other people will judge other skills you have from your drawing ability. Drawings are made more abstract to be helpful, instead of pictures which are more specific.

3. What if you could learn to use drawing to communicate through a new product:

"I would like to learn at home and practice at the company", there is no interest in learning at the company. There is also a preference for non-digital drawing: **"Just drawing on paper is nice"**. More time will be invested in the learning-drawing-product, if it fits the work he is doing. An imagined benefit of using more drawings for communication is that **"Drawing fits the role of a designer, it makes information more clear and there is less translation"**. There is a preference for a non-personal product, though he can imagine a personalized product might fit people from the target group more **"You get your own [drawing] style anyway"**

Interview: Nanco Vrijland

Owner and creator of a coaching agency

1. On current communication:

Current tools used (for communication) are the programs keynote and pages, in which he uses drawings more and more instead of written text. Photo's are used often to communicate to his clients, these photos are both his own and downloaded from the internet.

Communication can take just a few seconds when done 1-on-1, personally, to 1 hour in presentations. He regularly uses visual templates (usually printed at A4 or A3 format) for his clients to complete/fill in. He then interacts with his clients based on these templates; he shows a visual framework to which his clients add information, which he lets them present to him.

2. On current drawing activities:

At first drawings were not used in his work, as it did not have priority. Later the need to separate himself from other coaching agencies drove the need to use drawings. When he first became interested in drawing, searching for how to use it in his work gave him no results; only later when he searched again did he find resources for it. He now wants to use drawings to show he and his company is different from others **"I want to distinguish myself with drawing"**.

Using drawings himself, and together with clients is now a 'Unique Selling Point' (USP) of his company. The effectivity of his current communication rated high, with a self-reported grade of 9 out of 10.

3. What if you could learn to use drawing to communicate through a new product:

He would like himself and his colleagues to learn from the drawing-product in their own time, in combination with a plenary session. He would like it to take into account the different learning styles his employees might have. There is a preference for learning-by-doing, on paper (analog) over learning drawing digitally. Visible results of learning from the drawing-product would be a motivator to spend more time on the product. Money is not directly a barrier to start using it; he is willing to pay for the product.

His main concern for the product is that he does not have enough time to spend on learning from it, as his job makes his time scarce. He imagines his motivation has to be influence to use the product and make time for it: the relevance for his work must be clear. Another concern is that the product or the skill of drawing is **"Just nice to have", and not a 'must have'"**.

He imagines the benefits of the product as "making communication more fun, concrete and the connections between things more clear." He wants to "create more impact and emotion, using more senses", meaning that he wants his clients to engage in the coaching more, by using more sensory modalities than just listening and talking.

Interview: Eline van Beest

Managing director at Nightbalance, a YesDelft healthcare-product design company.

1. On current communication:

Communicates with all employees, every day in 'daily huddle'; a short daily company meeting where everyone stands and shares work-related news and progress on tasks. Every monday there is a weekly company meeting of 1hr. that is well prepared. Main communication is with email internally, and large team presentations are rare: less than once a month. These do feature diagrams and graphs, but no hand drawings.

A personal notebook is used, in which drawings are made, usually only diagrams/network structures. This book is mainly for personal use, but sometimes used in client communication for drawing something simple like a diagram or graph in 1-on-1 meetings. In the notebook a letter (A) in a circle is used to indicate action points, as a visual trigger for referencing important points from the notebook later on.

2. On current drawing activities:

Drawings are used by herself occasionally, but not by all other employees, and some have to be forced to make their work visual. "To some people it [drawing] feels like writing Chinese". On one occasion the sales process was to be visualized, but one employee perceived it to "cost more effort to visualize it than to type it". The value of visualizing is not clear to every employee.

From the contact with the book 'the back of the napkin' by Dan Roam, interest for using visualization and drawing started. Before this interest, using drawings and visual thinking was simply not thought of. Learning to use the 'rockefeller habits' program with the whole company; (a

structure for helping the company grow) was given priority over learning visual thinking. Other trainings such as timeplanning and pitch training had priority over visual thinking and were done with the team before.

3. What if you could learn to use drawing to communicate through a new product:

Eline stated that "there was an internal need [for drawings]" because "text was not enough". This feeling arose not only in her company, but in the entire collective of (121) companies in the YesDelft incubator. The help of a digital platform for learning visual thinking is okay, but she prefers to draw analog, on paper. She wants her company/team to pick up the skill of visualizing, like she sometimes uses herself. Her main worries for the new product are her employees (not) seeing the added value of visual thinking and that some people will feel bad using the skill since they just don't like to draw. Also a difficulty could be for her team to pick up and apply the skill in daily working life, besides only learning how to use it. Ideally she wants her whole team to learn this skill in their own time, outside of work.

She does not prefer a personalized product, but would like to be able to learn different styles of drawing.

Interview: Hans Maltha

Managing partner at Yes2Web ('Burst' since 01-02-2014), a webdesign/webcampaign agency.

1. On current communication:

Main communication is phonecalls, email, internal company chat messaging and face-to-face talking. The preference is for face-to-face communication since otherwise **"emotions can be interpreted wrongly"**. Communication in general in his company is deemed very important, especially that it is continuous. He states that "communication is difficult to scale up".

In general he sees that in his work and communication the focus on using images is increasing. A reason for he thinks, is that "images work like a hook": meaning that people remember more information when it is visual. Another reason is that he **"emotion is more important than digits"**, implying that images convey more emotion.

His communication takes from a few seconds to a maximum of 2 hours, and a maximum of 30minutes for presentations. In his presentations he states that "images communicate emotion, talking conveys the message" and "images strengthen that message"

2. On current drawing activities:

In face-to-face communication he uses drawings in a personal notebook or on pieces of paper, mostly with employees, and sometimes with clients. These hand drawings he uses daily, and more and more he uses pictures of his hand-drawings to communicate as attachments to emails and whatsapp messages (a smartphone instant messaging application). When he sends his hand drawings, he expresses that he always has to add extra information to the drawings, either by additional phone call or accompanying text.

Within the (powerpoint) presentations he gives he deliberately uses more and more images, but not yet hand drawings.

He is disappointed that his employees don't use hand drawings enough. Although they do use and create images, they often use computers and software like Adobe Photoshop, instead of quickly drawing by hand. He thinks reasons for this are the prior education of employees, where a digital-only workflow can be learned, in combination with a lack of practicing hand drawing. He thinks this lack of hand drawing lessons and practice can cause a feeling of shame for people. He quotes a common statement he has heard from others regarding hand drawings; **"[if I use hand drawings] then it doesn't look good"**. This means he recognises that people care about the quality of the drawing itself more than how effective it is and how much meaning it has.

According to him other barriers for using visual thinking are that you have to explain to people why drawing is relevant for them, and that he feels there is always extra information needed besides just the drawing itself.

He himself hasn't done any training to learn visual thinking because the priority for it is lower than other activities.

3. What if you could learn to use drawing to communicate through a new product:

He states he does not want to be commanded about what, how or where to learn visual thinking. He wants to learn at his own pace, and says that "everyone learns in their own way". He prefers drawing analog, on paper, and imagines that it is good to force people to draw on paper, so as to prevent them from using only software to draw. "Personally I do not want to draw behind a laptop"

For product functions he imagines it to use gamification to motivate its users, and that it can provide certificates of their skill. He thinks that feedback should not be given in

an either-right-or-wrong framework; meaning that critique and feedback can greatly influence users.

He imagines his ideal product as one that lets him learn at his own pace. When, where and how long he wants, with the product providing short or small 'blocks' of material, that quickly generate results for the user, while still allowing users to spend more time and effort into gaining deeper knowledge or more practice if they prefer. The results for the user can be a part of gamification, and address the **"progression eagerness"** of users. The product could be sold according to a 'freemium' model, meaning a basic part of the product is free, and users pay for any additional content. He imagines users to learn from the product in their own time, not during work.

He expects the product to **"just provide an extra means of communication"**, besides the current means such as talking and writing. The product would get the barrier to use drawings for visual thinking out of the way.

Types of Visual Thinking

Looking at the application of visual thinking within business contexts, different types of visual thinking can be discerned.

PS: Personal Sketches

Personal drawings/sketches made by a someone of his/her own mental models. This is not always intended for communication, and can therefore be difficult to interpret for other people than the visualiser.

VTr: Visual Translation

Drawings made live by a visualiser of someone else's mental model: Drawing out someone else's mind with the purpose of interactively increasing clarity of the mental model by iterating with feedback on- and revisions of- the drawing.

VC Visual Communication

Drawings made with the explicit intention to communicate information to others. Often they are comprehensive images to explain a complete story; storytelling. In practice they are suited for powerpoint presentations and posters (A3 size) where a presenter explains the story that is facilitated by the drawing.

GF: Graphic Facilitation

Drawings made during (group)meetings, that facilitate the meeting, and so there is an interaction between the drawing, the visualiser the facilitator and the audience. The drawings are made by a dedicated visualiser, who can have a double-role of facilitator.

GR: Graphic Recording

Drawings made during (group)meetings, where the the visualiser purely has a recording role, and the drawings are not used interactively during the meeting, but often as visual notes/minutes for after the meeting.

AN: Animation

Drawings with the addition of motion over time. Animations are a way show the order and emergent structure of drawings without drawing live. Videos can also incorporate audio, such as a story or explanation by voice-over, or music for setting a mood.

IL: Illustration

Drawings to simply make a concept visible, instead of text, spoken word or mental model. An illustration does not necessarily communicate extra information (content) other than a visual appearance (it's form).

SN: SketchNoting

Notes made during a presentation or group meeting, consisting of text combined with drawings. In practice they can be used personally, but are often digitally shared with the original audience or others after the event.

DD: (Industrial) Design Drawings

Drawings to communicate information in design contexts such as product design or architecture, in practice often relating to physical objects.

CD: Concept Design

Drawings to suggest the reality of concepts or ideas, with a pseudo-realistic style. These are often used in the movie- and game design industries where quickly communicating moods, emotions and environments is important.

EN: Entertainment

Drawings made for entertainment purposes, such as comics, (live)cartoons. Like illustrations they do not necessarily communicate extra information other than their form.

IG: Infographics, information architecture

Drawings that purely communicating data and information in a visual way. In practice infographics are usually made and spread digitally through the internet, and are centered around a central theme.

MM: Mind maps, concept maps

Combinations of drawings and text along a tree structure, originating from a central theme. Usually made to get a thought process going, and get obvious associations and assumptions clear at the start of a new project.

SK: Sketch Kits

Drawings prepared in advance, intended to be interpreted and completed or enhanced by other people (the users of the drawing) by writing or drawing on the drawings themselves, without an interaction with the visualiser. Usually large (A3+) template papers.

Design Requirements

Requirements	Design possibilities	Wishes	Challenges
Create awareness of visual thinking within the target group (A1)	<ul style="list-style-type: none"> -Show cases of how VT can be applied in practice, using realistic depictions like photographs and video. -Show a comparison of VT to other forms of communication -Let people experience VT by seeing others do it (live or non-live) 	Awareness can and should transform directly into motivation for users.	<ul style="list-style-type: none"> -Reaching a wide audience, not just a few people. -Reaching the people in the selected target group
Help users to create motivation to start and keep using the VT product/platform (M1, M2, M3)	<ul style="list-style-type: none"> -Explain the effectiveness of using VT by (visual) examples -Show cases of how VT can be applied with photographs and video can to maximize the in projects. emphasizing not one, but -Providing interactive feedback by using the user base itself as a social system (e.g. crowdsourcing), such as peer reviews&critique, -Showing users' progress, possibly combined with the gamification of progress such as a reward/milestone system. 	<ul style="list-style-type: none"> -Users do not only start, but keep coming back to the product/platform -Progress builds motivation 	Not scare or demotivate users by giving (interactive) feedback, users should not feel it as personal critique
Facilitate experiential learning	<ul style="list-style-type: none"> -Using the Kolb cycle/learning styles model to guide users through practical and theoretical aspects of learning, so different learning styles are represented -Letting or forcing users to apply their knowledge in practice. 	Theory is directly connected to practical exercises, which are connected to actual real-world practice	Get users to start drawing without thinking about it: (temporarily) make barriers invisible
Adaptive difficulty of learning materials	<ul style="list-style-type: none"> -Letting users do pre-made tests to determine their skill level, -Let users skip low-difficulty tasks (self-diagnose) 	The adaptation is automatic, feels natural and ideally it creates a flow state for the user.	Balancing user's skill vs their challenges, and still let them be in control
Learners (users) should feel in control of their learning	<ul style="list-style-type: none"> -Let users determine and set personal goals and plans, through a decision tree leading to a user-profile to see where&how to improve themselves. -Giving the users an overview of their progress -Allowing users to start/stop anytime (saving their work & progress) 	The control creates motivation to keep	Not giving control at the cost of the quality of learning: only letting them féél in control
Product is scalable: no time/location constraints	<ul style="list-style-type: none"> -Making the product digital, so it can accommodate a large user group. -Let users make use of common/ubiquitous materials to 	Creating a large, possibly international user base.	Making the product fit individual needs & learning styles
The design is modular; allows new content	<ul style="list-style-type: none"> -Platform function, modules contain separate lessons 	Users can see the value of newly added modules and buy&learn them	Making new insights/lessons compatible with the product
The product/platform use is interactive	<ul style="list-style-type: none"> -Develop a visual database of users' drawings for everyone to use and learn from. -Anonymous crowdsourced social reviews and critique on drawings -Automatic, digital image recognition 	Providing enjoyment while using the product: not only result=reward, but also action=reward.	Making the user interaction as effective as possible for learning VT

Brainwriting HCY Results



Brainwriting Outcome Evaluation & Ranking

How-Can-You Question	High Potential (+ +)		Medium Potential (+ -)		Low Potential (- -)	
HCY: Help people start with drawing.	Finish prepared materials, such as tracing dotted lines	Just-In-Time (In-Situ) help and tips for users during learning	Use gamification principles	Teamwork by peers during learning assignments and exercises	Inspire users with images or examples from peers and experts	Learn-by-seeing others drawing process
HCY: Help users learn VT together with other users (peers).	Discuss & Talk about each other's drawings and	Work on drawings together and always do visual thinking as a team exercise	Compete and compare people's drawing results and skills to peers		Learn-by-seeing others drawing process	
HCY: Provide a positive first experience with VT.	Keep the first drawing experiences very simple and accessible to users; use the skills they already have	Aid people in their drawing with clear steps, a clear structure and pre-made materials	Compare people's drawings to other not-so-good drawings		Provide a pleasurable and relaxing context/ environment where people are not afraid to make mistakes	
HCY: Show user's progress on learning VT.	Visually show their progress through the course material, in relation to a total	Let users reflect on their work, goals or pre-defined competences set by the course	Rank and compare users skills and progress to each other		Let users measure their own progress without help of the product	
HCY: Involve user's work context in the learning process of VT.	Break down the process of visual thinking in multiple small steps for users, and present these as a 'wizard' function for the user to go through step-by-step	Separate the what-to-draw and how-to-draw questions for users	Explain how VT works and where, in what situations VT is useful to users, by showing these situations to users		Make all assignments and exercises in the product involve company stories, structures or problems to be visualised.	
HCY: Make users apply VT in the user's work context.	Make drawing a fun and relaxing exercise at work	Guide users step-by-step during their work when they apply visual thinking	Do visual thinking training at the work location, not at home	Reward users unconditionally for applying visual thinking at work	Force users to draw at work	

Usertest Concept Iteration 2: Preparation & Questions

Goal & research question

To get feedback on the concept design a preliminary test with users was done. The purpose of this test was to check that the intended functionality and interaction of the design, leading to the main question:

Does the core functionality of using word associations in combination with example drawings help to make the process of visual thinking more accessible and easier?

This was assessed by the user's indication of how difficult the drawing assignment was perceived to be before and after the test. A scale from 1-7 was used to quantify the difficulty level.

Method

Participants were selected for their inexperience with drawing and unfamiliarity to visual thinking. The participants were two students from mechanical engineering, and one employee at TNO.

Each participant was explained what visual thinking was with a live simulation of the movie playing on the landing page of the design, the process of the test, and given the paper prototype of the interface.

The four steps of the drawing feature were then followed by the participant. This started with getting the prepared test case story, and highlighting relevant elements according to the participant.

These highlights were checked for correlation to the pre-selected keywords and then the participant made the drawings for each of the 9 keywords on paper.

During the drawing the user was free to use the word-association-cloud in the app to find an easier word to draw. Then the keywords

Test case story

"There is a situation in one of the teams of 3 people that I lead. I think only two people from different teams don't communicate and misunderstand each other, which causes one team to often miss their deadlines; they missed 4 out of 5 targets!

If you can convince your boss to pay for a team event with a workshop and dinner, then everyone would get along again: you want everyone to be connected and to see a smile on everyone's face again, not only for one team, but for both."

The pre-selected keywords and their associated words from this story:

situation	problem thoughts cloud questionmark
communicate	talk textballoon connection
team	people group person
deadline	target target reach disconnect bridge
convince	switch checkmarks realise idea lightbulb
workshop	hammer table meeting people team
boss	team tie suitcase pyramid
happy	smile face smiley
pay	buy money exchange pricetag euro

Results

- All participants were able to complete the assignment and go through all the steps.

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- All participants got the information needed from the introduction video to understand what Visual Think was.
- Two participants stated that drawing from the highlighted keywords is easier because it breaks the bigger problem of drawing a story down into its basic components.
- The scores for difficulty were lower for each participant after doing the drawing exercise. Between 1 and 3 points easier out of 7 options from easy to difficult in total.
- Two participants were reluctant to use the example drawings provided; instead they wanted to make their own drawings.



Main usertest questions:

Are users aware of how VT works?

Does word-association help make VT easier for users?

Do the examples make drawing easier for users?

can people explain their own visualised story?

Is the experience like the interaction vision?

Four Steps of the prototype:

1. Gain awareness of VT,
2. Start VT proces (Abstraction)
3. Make own story (Storytelling & Drawing)
4. Share story (Presenting)

During entire test:

- What is difficult/unclear? when is extra information/hed
- What are people's emotions?
- What do people expect of the interface (size, medium, amount of screens, overview, style)? (based on wireframe)

Before test:

- Does the participant know anything about VT? y/n
- Does the participant know the value of VT, and what it is used for?
- explain what VT is : using drawings to help think & communicate (abstract thinking+drawing +comunication)
- How much does the participant understand what VT is after hearing a brief explanation?
- Does the participant understand what VT is after seeing an example drawing (video)?
- explain what product does (result), and the use phases, and the intended user
- explain the test
- Does the user understand the product phases/steps and functions?

During test: Story

- test story is given
- give people a pen/marker
- participant user reads the story, can make notes already
- What is the perceived difficulty level of the drawing exercise?
- do you think this story is difficult to describe in a visual way?
- how difficult do you think it is? scale 1-7, keywords/ qualitative description
- Do participants understand the story they will be visual thinking with? If they don't , ask why. Do they think the story should be told in another way?

During test: Word-association

- participants get questions to help them think about what to highlight
- participants highlight their keywords (max 10)
- compare participant highlighted words to my pre-chosen keywords
- Do the participants highlight the same relevant words as pre-chosen selected?
- give people the pre-chosen keywords to work with
- people do word-association on pre-chosen keywords (max 10)
- Do participants think about the same keywords?
- Can participants associate new words to the keywords?
- Can people draw the keywords directly, without associating other words?
- show participants my pre-chosen word associations
- participants can 'click'/choose keywords
- Ask people: do they think the associating part useful? do they get more inspired? Do they need any other help during this activity?

During test: Drawing

- Do people prefer analog or digital drawing?
- participants draw the keywords (9x) on iPad
- participants can see examples and animated .gif examples for drawing, on a laptop
- Do participants use the example drawings? can they copy it? what are the difficulties/good points?
- Do participants need any other help; are words enough?

During test: Sharing

- Can people explain their own story digitally with recording their gestures and sound?
- participants explain their drawing/story verbally
- explanation is recorded on video+audio
- show gallery, show team page
- What do users expect to get from a teamwork and sharing component of the website?
- What help/information/functionalities do they want here?

After test

- ask participants few questions
- Do participants understand what VT is better now they have gone through the steps?
- Was the experienced difficulty for the participant lowered by the product through word-association?
- on a scale of 1-7, keywords/qualitative description (did the difficulty get lower)
- What interface style do participants imagine to be comfortable with?
- Is the imagined user experience created by the product?
- What is participant's over-all experience? worries/ concerns/positive points/ideas/questions

Usertest Final Design: Preparation & Questions

Test Limitations

Every test has its limitations as to what it can test:

- A time duration of maximum 60 minutes for the test;
- Not all interactive elements are functional,
- Only the first encounter with the product is tested;
- Repeat-use is not tested, results of

Preparation Steps

Greet participant, offer coffee/tea/water

Introduce myself & project

Establish previous experience with visual thinking

Explain the usertest: what is going to happen and why, what for. (graduation, VT, evaluate design)

Explain order: test+drawing, then interview

Explain that I want to see exploration of the pages

Show related materials needed. (paper/pen/images)

Explain recording/capturing video&audio

Start ScreenFlow recording

Test Steps

Read the state-of-mind introduction for the participant.

Give starting tasks for each set of pages for one function.

Observe the participant

Stop ScreenFlow recording (cmd+shift+2)

Interview Steps

Ask interview questions, encourage giving motivations for answers (why questions)

Afterwards:

Thank participant

Offer reward/gift/drink

Save ScreenFlow file

Frame of Mind Text

"Your company has decided to train its employees by learning 'Visual Thinking'. You are going to learn this from a web-based application called 'PaperPlane'. Imagine you can use this product on a tablet or laptop where you want; it doesn't have to be at work.

This is the first time you are going to use the product to learn VT."

Materials:

Laptop, HTML web-based prototype, A4 Paper, Assortment of pens, Photocamera, Paper parts of the website (drawings), ScreenFlow app, Drinks, Small gift/reward,

Test questions & structure:

Below are all the tasks users have to perform on each page of the prototype. It is listed per page, together with the questions to be asked at that page during the test, and page's goal for the user.

Homepage & Sign Up & ProgramSelect

Goals: Introduce VT

Provide information on VT to users with no knowledge about it. The home page introduces visual thinking; what it can look like and how it can be used to the user

User tasks:

Observe/explore, and get information about VT.

Sign up for the PaperPlane platform, to start learning VT.

Questions:

What can you do on this website

Do you know what visual thinking is? what activities & what context?

How can you start using PaperPlane and start learning VT?

What are the VT programs?

Dashboard (1st visit & later visit)

Goals: Show Progress & Course selection

Let the user start with visual thinking by selecting the first course:

Show the user's progress of how many courses and difficulty levels have been completed.

Provide continue option show the current/last course the user was doing: pro

User tasks:

Explore and identify the functions on the page. Browse the courses and start a course.

Search for a course. Switch between programs

Questions:

Can you identify all functions of the dashboard page?

Do you know how to find, start and continue course?

Can you see how the rings-progress indicator works and corresponds to the courses?

Course Basics Overview

Goals: Overview & Expectation

Give a brief overview of all modules in the course

User tasks:

Explore the functions of the page.

Get more information about the course and start the first module.

Questions:

Do you have an expectation of the course modules?

Course Module 1 to 11

Goal: Teach & Involve

Transfer the learning content through multimedia images/video/audio

Involve the user by making the user draw along with the module (exercise)

User tasks:

Follow the course modules, draw along with them.

Stop mid-course, and continue later

Questions:

Do you get a positive impression of the course?

Did you feel you had control over the pace of the course modules? What are all the controls for?

Were the modules too long or short?

Assignment (A)

Goal: Apply skills&knowledge

Let users apply their new knowledge and drawing skills in a work context. Right after doing the

User tasks:

Follow the instructions on the page: do the drawing assignment.

Questions:

Are the page functions clear?

Were you able to apply the newly learnt knowledge als this exercise difficult or easy for you?

Self Review (Rs)

Goals: Reflect (backward, inward) & validate own work and progress

Review users' own drawing, to reflect on work and learn from the process.

Generate a rating and motivation to learn further.

User tasks:

Review your own drawing

Questions:

Was the review difficult to do? Did it take too much time?

Were the questions and the button functionalities clear enough?

Community/Peer Review (Rp)

Goals: Reflect (outward) & validate own work and progress

Provide a step-by-step guide for reflecting on someone else's drawing and your own simultaneously, by comparing.

User tasks:

Switch between other user's drawings.

Give a rating for someone's drawing.

Leave a comment on another drawing.

Questions:

Was the peer review more difficult to do than the self review? If so, why?

Were the questions and the button functionalities clear enough?

Did you understand the give-review=get-review functionality from this page?

StoryTool

Goal: Tool/Wizard

Provide a step-by-step guide for visualising your own story in context

User tasks:

Go through the steps, with the assignment in mind.

Questions:

Can you identify the Abstraction-Structuring-Drawing structure from the assignment in it?

Imagine you have your own story to visualize: could you go through the tool within your context?

Visual Library

Goals: Support drawing

Can you use the visual example

User Tasks:

Observe/explore, open all tabs and explain what their functions are

Questions:

Could you use the visual examples as inspiration while drawing?

My Page

Goals: Show statistics & activity

Show user statistics, Store/review all past and future user activities.

User tasks:

Observe/explore, and explain what the functions of this page are, and what it can do for you.

Questions:

Part 2. Interview questions:

After the users, each participant was invited to voice their general opinions on the design's experience and usability. In addition, there was a set of interview questions. Some of these were already answered during the test.

Questions: Draw experience (method)

- Would you like to use the product again/more later? Do you feel you want to draw more now?
- Are you more confident/comfortable in using simple drawings for work?
- Do you understand how simple drawings from VT can work within your company?
- Does the community-review aspect help you or motivate you to use this product? Why?

Questions: Use experience (about website)

- Do you feel in control of the learning process? also guided? Is there a good balance?
- Have you learnt a part of VT? Could you apply it in your work context?
- How do users experience the exercises?
- Do users learn something extra from the reflection (review) besides the
- Are you motivated to keep learning VT? also to keep using this product? Why?
- Is the functionality of the design clear for you? Did you have problems? What kind?
- Is the structure of the learning method clear to you? What isn't?

GRADUATION REPORT

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