Collaborative Network for Industry, Manufacturing, Business and Logistics in Europe

D2.4
User Experience Design for Fast System Adoption

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	Benjamin Mandler	IBM
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Abstract

This document describes the overall User Experience Design methods applied during the concept and implementation phase of the NIMBLE platform. Therefore, standard Human-Computer Interaction methods will be employed in addition to aspects perceived relevant by the use cases. The focus is on ease of use targeting small and medium enterprises with limited platform experience and resources. Where possible, crowd-sourcing techniques should be employed in order to develop knowledge resources that are made available to the users of the platform (for example, the development of sector-specific vocabularies or taxonomies, for semantic annotation).

NIMBLE in a Nutshell

NIMBLE is the collaboration Network for Industry, Manufacturing, Business and Logistics in Europe. It will develop the infrastructure for a cloud-based, Industry 4.0, Internet-of-Things-enabled B2B platform on which European manufacturing firms can register, publish machine-readable catalogues for products and services, search for suitable supply chain partners, negotiate contracts and supply logistics. Participating companies can establish private and secure B2B and M2M information exchange channels to optimise business work flows. The infrastructure is being developed as open source software under an Apache-type, permissive license. The governance model is a federation of platforms for multi-sided trade, with mandatory interoperation functions and optional added-value business functions that can be provided by third parties. This will foster the growth of a net-centric business ecosystem for sustainable innovation and fair competition as envisaged by the Digital Agenda 2020. Prospective NIMBLE providers can take the open source infrastructure and bundle it with sectorial, regional or functional added value services and launch a new platform in the federation. The project started in October 2016 and will last for 36 months.

Document History

Version	Date	Comments
V0.1	09/10/2017	Initial skeleton version
V0.2	23/10/2017	Added basic content (SRFG)
V0.3	20/11/2017	Extended basic content based on partner input (SRFG)
V0.4	30/11/2017	Ready for internal review
V0.5	19/01/2018	Addressing QA comments (bm, wb)
V0.6	31/01/2018	Final draft
V1.0	03/02/2018	Submission (wb)

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Acronyms

Table 1: Acronyms table

Acronym	Meaning
HCI	Human-Computer Interaction
NIMBLE	Collaboration Network for Industry, Manufacturing, Business and Logistics in Europe
UI	User Interface
UX	User Experience

1 Introduction

This document includes an initial set of standard HCI methods used throughout the requirements capture, specification and implementation tasks. Additional methods have been selected based on the use case requirements (WP1) and the Platform Architecture Specification and Component Design (T2.1).

D2.4 is strongly linked to the User Front-End Prototyping for Fast System Adoption (T3.7). In order to avoid overlaps D2.4 is focused on the analysis and concept/design phase while D3.7 will report mostly on the implementation and evaluation phase.

Since the implementation task T3.7 carries on further beyond T2.4, any additional methods will be applied and reported in deliverable D3.7.

2 User-Centered Design

According to [Norman1986] user-centered design is an iterative design process for products and systems that focuses on the users, their tasks and their environment. When properly applied, it reduces the development time and costs and increases the quality of the product by avoiding unnecessary or unwanted features, detecting problems at an early stage and balancing usability and UX (user experience) factors.

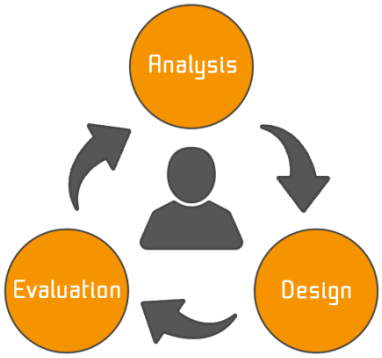

Figure 1 – The User-Centered Design cycle

The three-stage process consists of:

- Analysis

  Analysis is essential since expressing and communicating needs is difficult. Various analysis tools exist, such as information and literature research, task analysis, cultural probing, personas and scenarios. In NIMBLE, this stage is covered by WP1.

- Design

  The design stage includes merging analysis results and defining what is needed for the implementation and how to measure the success. Therefore, conceptual models, storyboards and use cases are key elements. Continuous prototyping helps to create and evaluate requirements. Prototypes are categorized into low (no detail, quick overall feedback), medium (more detail, design feedback) and high fidelity (close to final product, usability feedback) depending on their degree of detail. In NIMBLE, this stage is covered by WP2 and WP3.

- Evaluation

  Evaluation is needed in order to rate previous decisions, identify usability and user experience issues and create new ideas. The two main evaluation categories are expert (experts rate and improve usability factors based on heuristics) and user tests (qualitative or quantitative data is derived from various

evaluation methods; e.g.: interview, questionnaire, focus group, observation, benchmarking, thinking aloud). For user tests it is important to conduct pilot tests, create detailed test plans and record all data (e.g. by transcript, audio/video recording, software logging). The evaluation results serve as a basis for the next iteration. Depending on the severity of the detected issues, one may draft new prototypes, go back to the design process or even expand the analysis. In NIMBLE, this stage is covered by WP4 and WP5.

2.1 User Experience Aspects in NIMBLE

The overall project management of NIMBLE aligns well with the three-stage process. “Use Case Requirements and Collaboration Design” (WP1) deals with the analysis stage, “Platform Technology Specification” (WP2) and “Core Business Services” (WP3) deal with the design and implementation stages and “Use Case Experimentation, First Round Validation and Evolution” (WP4) addresses the evaluation phase. Furthermore, “Value-added Business Services for NIMBLE” (WP5) initiates a new design cycle.

At finer granularity, more frequent short-term cycles are also required; especially during the design/implementation phase. Therefore, interaction logs as well as a direct feedback system for feature requests or bug reports to the technicians are used in the live version of the platform.

The interaction logs track the following parameters:

- Navigation paths and errors
- Utilization time per page and component
- Idle time per page and component

The direct feedback system includes:

- The current navigation path
- A screenshot during the report (data fields anonymized)
- A message provided by the user

[Vetrov2015] gives some important insights into a platform approach for an applied UX strategy. He suggests moving from a narrow goal-oriented workflow to a holistic approach on the operational, tactical and strategic level. This approach allows for a systematic growth and a constantly evolving platform due to minimizing overhead produced by formulating elaborate design and implementation guidelines.

In NIMBLE, we act according to the applied UX strategy on multiple levels:

- Maintaining a central overall feature list and architectural design of the whole platform
- Breaking down features (and feature complexity) into three-monthly releases while trying to achieve an exponential user base growth with each release

- Documenting relevant user feedback by means of public issue tracking on GitHub[1]
- Employing documentation and communication channels for developers and platform managers on Confluence[2] and Slack[3]

[1] https://github.com/nimble-platform
[2] https://www.atlassian.com/software/confluence
[3] https://slack.com

3 UX Design

There are varying definitions when it comes to UX. In the following chapter UX is addressed as a combination of usability and hedonic factors.

Usability factors are well established and have rather clear definitions. There is even a multi-part ISO standard covering ergonomics of human-computer interaction (ISO 9241). The most relevant factors are:

- Effectivity: How good is a system at doing what it is supposed to do?
- Efficiency: Does the system support the user in carrying out their tasks?
- Flexibility: Are there multiple ways to interact with the system?
- Learnability: How easy is it for a user to accomplish basic tasks upon first use?

In conjunction with web applications, UX factors have been introduced to determine how users interact with the system and how they feel about it. These factors are much more dependent on the specific user, their goals and the context. The most relevant of these additional factors are:

- Enjoyment: Is the system engaging and encouraging for users to continue using it?
- Trust: Can the system accomplish what it claims to, does it provide clear communication and does it protect user data?
- Aesthetics: Does the design appeal to the user and map to their mental models?
- Satisfaction: Is the system pleasant to use?

Since the evaluation of those UX factors will be part of WP4 this chapter only addresses how they affect the UI design process.

3.1 General approach

The focus is on ease of use targeting small and medium enterprises with limited platform experience and limited resources for engaging with the platform.

In order to achieve ease of use the system is based on a “one click to get it done” philosophy wherever applicable. In alignment with this philosophy, required user input has to be minimized. Furthermore, a minimalistic and clear design has to be pursued.

3.2 User Types

There are major differences in HCI design when it comes to age [Silva2014] , gender [Coppens2015] and general user types [Marczewski2015]. Those can play a crucial role in the perception of UX factors. Since NIMBLE has got very well-defined goals and a clear context as a business-focused, professional platform the above specific

differences are negligible. Nonetheless, the overall design criteria behind them have to be considered.

Each user interacts with a system in a different way. Thus, motivation has to be provided for each user type and the system has to allow for taking different routes and shortcuts for experienced users during system usage (this is also in line with the flexibility factor).

The system has to be designed for every use case and integrate manual as well as automatic switches between system paths. Manual switches can on the one hand include settings related to the display style, arrangement of interface elements, etc. (e.g. default interface elements on the dashboard). On the other hand, automatic switches are applied by the system depending on the usage (e.g. provide help texts for new users, hide/minimize interface elements depending on the user role, etc.). Those switches support all usability factors.

3.3 Visual UI design

The UI design on a visual level targets the additional UX factors. The functional level will be addressed in Chapter 4 (Mock-up Stage).

When it comes to UI design there is a variety of human interface guidelines [HIG2017] for various major platforms. In order to achieve a consistent look and feel independent of the platform we decided to develop a custom theme based on Bootstrap[4]. Bootstrap is a HTML, CSS and JS framework for responsive web and mobile interfaces that implements a majority of web and mobile design principles from scratch and allows for easy adaptation.

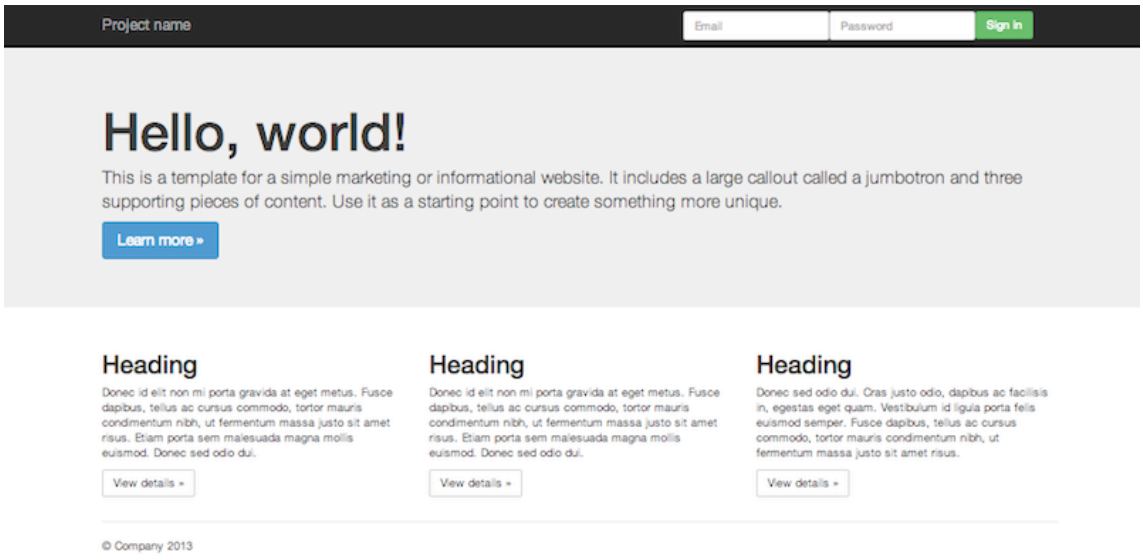

Figure 2 – Dummy Bootstrap components

[4] https://getbootstrap.com

In addition to Bootstrap we decided to keep the “NIMBLE red” as the only color apart from greyscale for a minimalistic design and professional corporate identity. The only exception are standard Bootstrap colors for info, success, warning and error fields since those are tightly mapped to the users’ mental model and thus crucial in terms of efficiency and aesthetics. Furthermore, icons are used in combination with interface elements to speed up the recognition and learnability and with regard for vision impaired users.

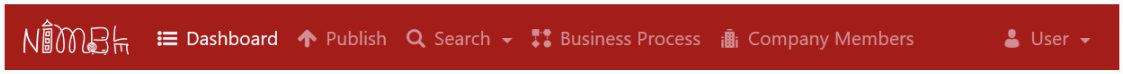

Figure 3 – Corporate Design

The following decisions were made in order to improve the UX design:

- Highlighting and enlarging currently relevant UI elements (that have been updated and/or require user interaction)
- Consideration of Fitts’s law [Fitts1954] in UI design: Minimize spacing and scrolling as well as general navigation between triggering UI elements
- Guiding information and help messages for new users as well as long-term processes (e.g. step-by-step workflows involving multiple UI components)
- Privacy flags for all optional fields and confidential company data in order to enable trust and protect user data

4 Mock-up Stage

Before starting the actual design and implementation, low-fidelity mock-ups were created as part of the early design stage, in order to obtain quick overall feedback by the use cases.

Since the UI Prototyping (T3.7) started before the UX Design a first iteration was carried out early in the project for the purpose of presenting core service mock-ups at the use case meeting with Lindbäcks in December 2016. Furthermore, the mock-ups were distributed as a dynamic prototype to all use cases using the online tool InVision[5].

In this way, we assured a close collaboration between the requirements gathering and design tasks and allowed for vital adaptations without much effort at an early stage.

In the following subchapters all core services will be addressed along with some relevant mock-ups, user feedback and consequent design decisions.

4.1 Registration

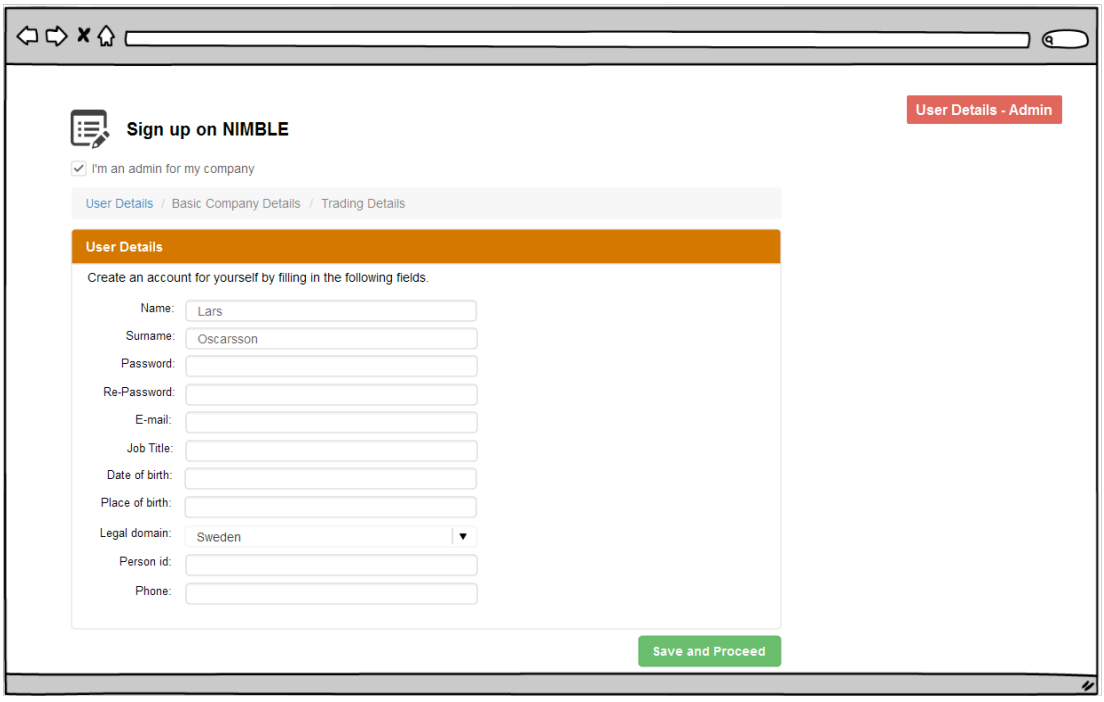

Figure 4 – Registration mock-up

[5] https://www.invisionapp.com

The registration was initially designed as a process with three steps where the user enters relevant user details and – in case they are the "admin" or legal representative of the company – the company and trading details. This process is supposed to be carried out before performing any platform activity.

User feedback:

- One user might be linked to multiple companies
- Several input fields (e.g. place of birth, phone number) were not vital and were seen as a deterrent for prospective users

Design decisions:

- User and company registration have to be separated
- Input fields have to be minimized to vital ones and only a few should be required (nonetheless fields such as passport ID, VAT number, etc. may increase trust)
- Basic search functionality should be available without registration in order to attract new users
- The legal representative of a company needs a management interface for company members and roles

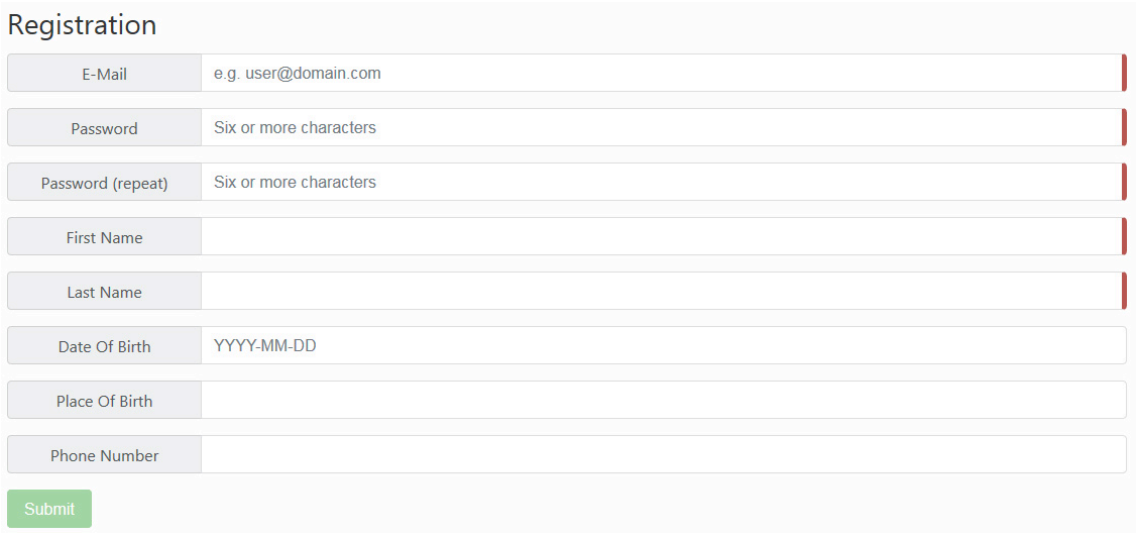

Figure 5 – User registration (first release)

Note: After performing the user registration a user can either register a company in a separate registration form or be invited to join an existing company by an eligible member.

4.2 Dashboard

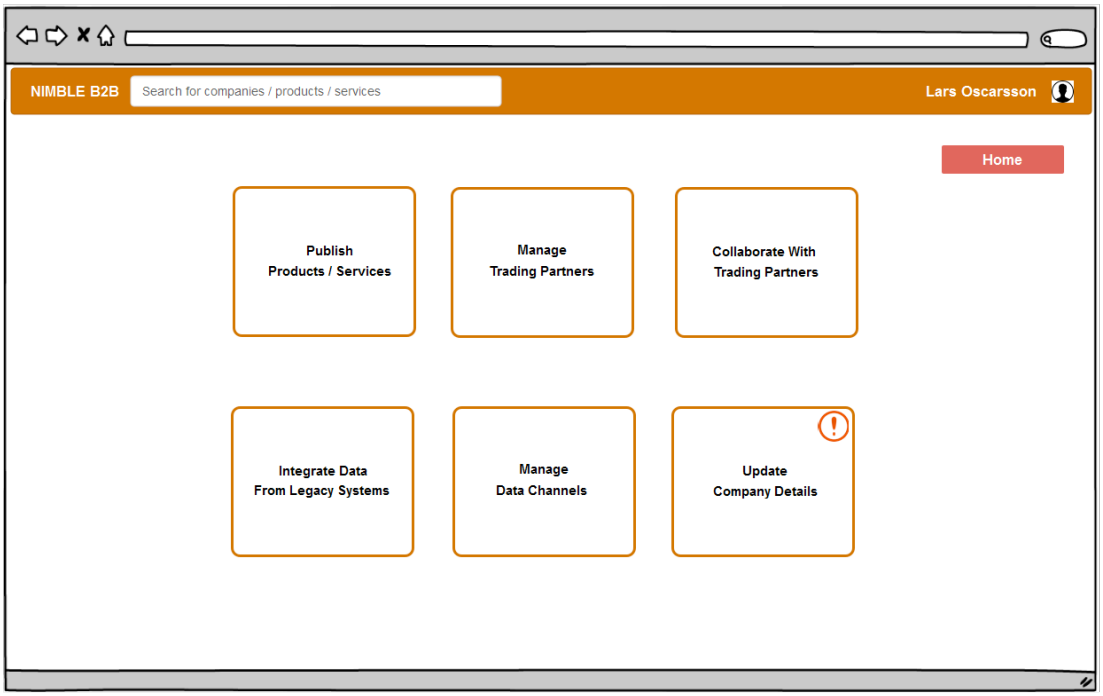

Figure 6 – Dashboard mock-up

The dashboard was designed as a kind of fast-access navigation panel where panels that require interaction are highlighted.

User feedback:

- Once the system contains advanced features this kind of representation may become confusing
- Relevant data should be presented right after login

Design decisions:

- Swap to a “classical” navigation bar
- Hide irrelevant menu items based on user role and settings
- Present relevant transactions and processes that have been updated and/or require interaction as a list view without requiring further navigation on the dashboard

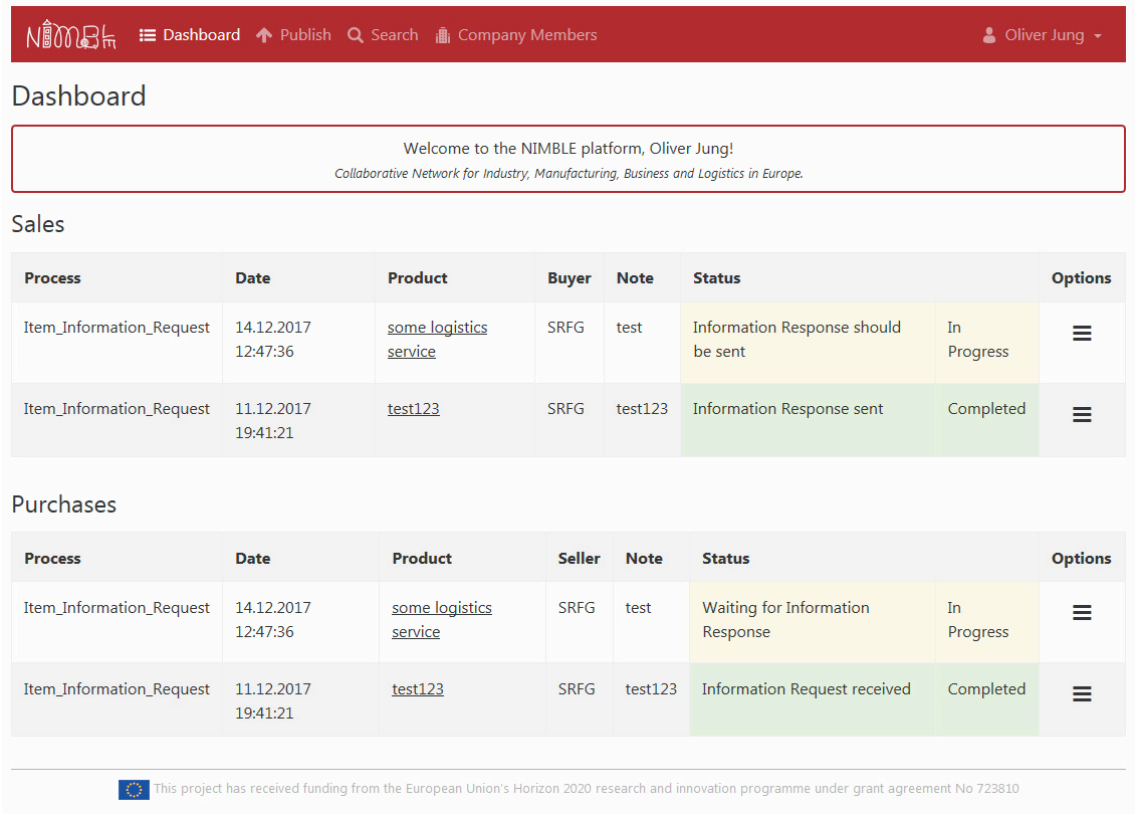

Figure 7 – Dashboard for a "legal representative" (first release)

4.3 Publishing a Company Catalogue

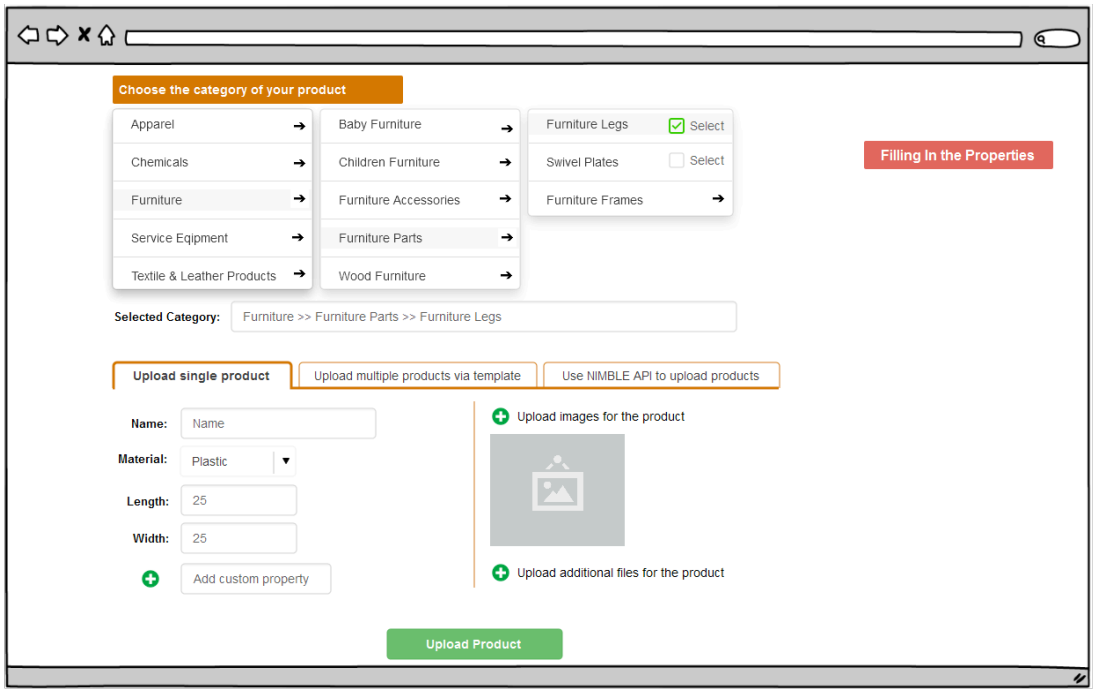

Figure 8 – Catalogue publishing mock-up

The catalogue publishing service was designed as a process where the user searches for or selects the relevant product/service category and then uploads a single product using input fields or multiple products using a template (Excel-based) or API endpoint. This process is quite common on major eCommerce platforms.

User feedback:

- The number of input fields for some product categories is pretty high
- Some input fields seem irrelevant or are obscure
- The template structure is not self-explanatory
- Catalogue items should be uploadable as a draft before publishing

Design decisions:

- "Common" input fields (e.g. name, description, id) should always be shown on top while the rest should be collapsed by default on single item upload
- Explanation texts should be added to the input fields
- Example templates should be provided
- A catalogue management interface is required for managing and publishing multiple items or products

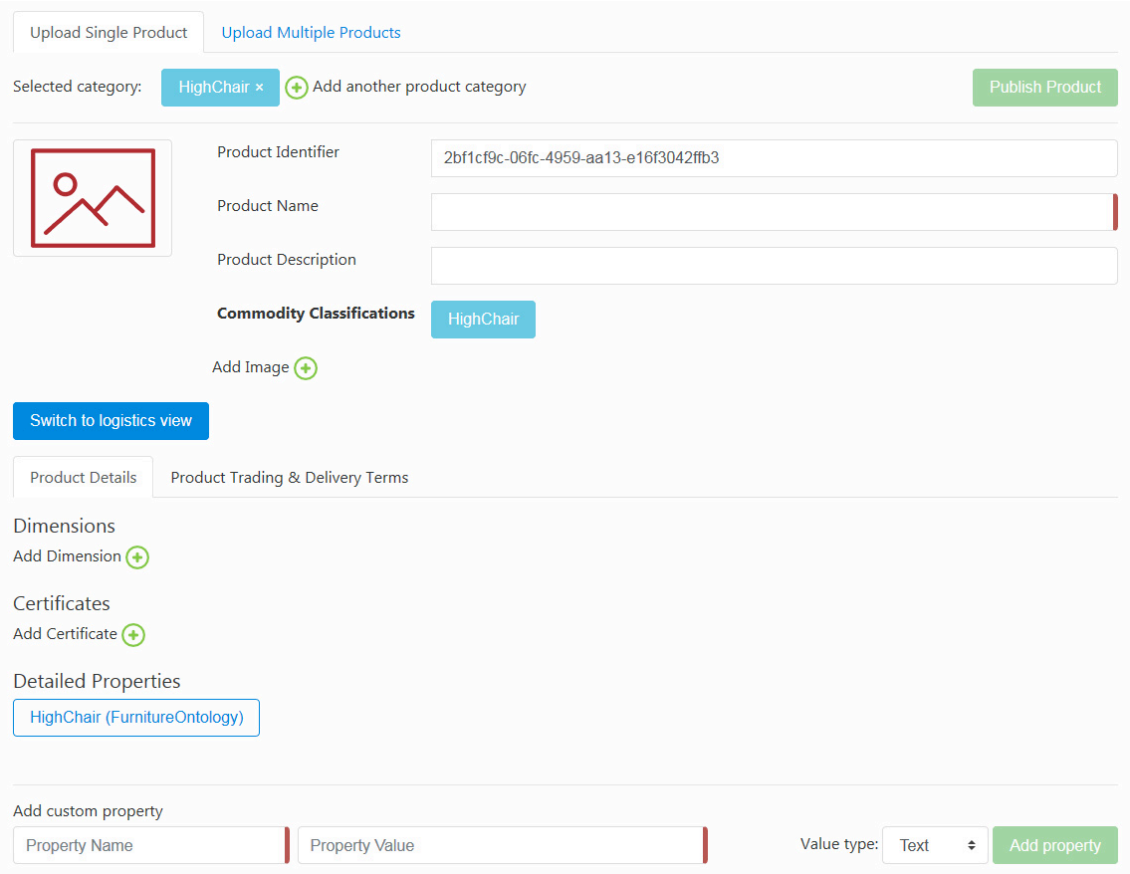

Figure 9 – Catalogue publishing (first release)

4.4 Searching

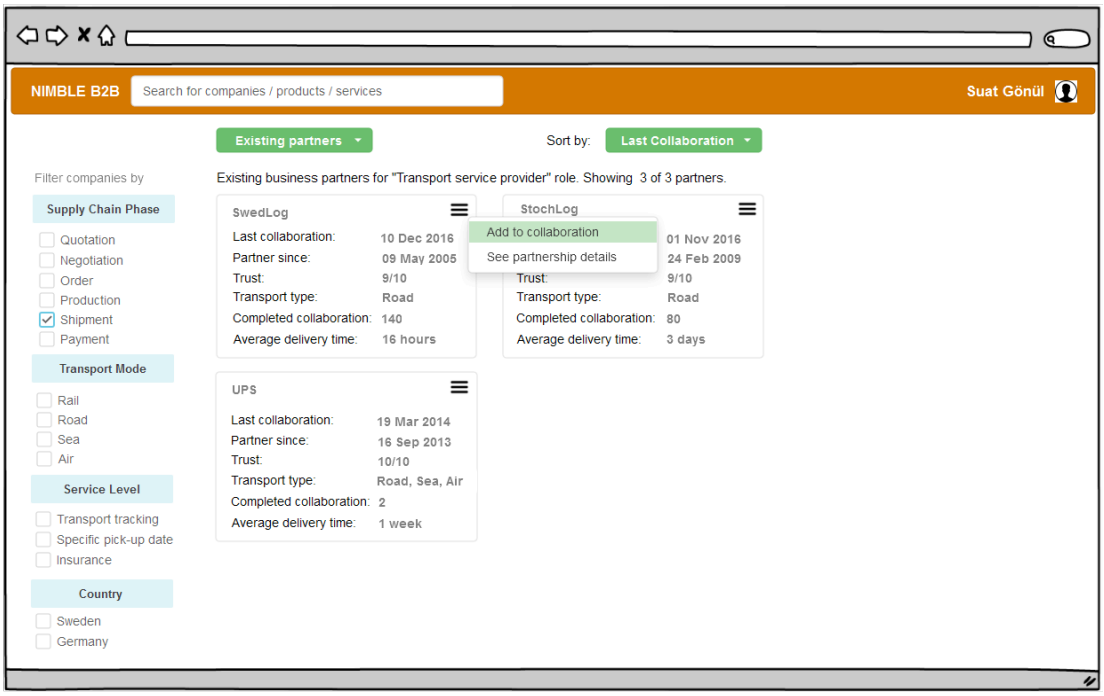

Figure 10 – Search mock-up

The search has been designed as a “classical” text-based search with facet filtering. Depending on the search result various business processes are available for each item.

User feedback:

- The search for a (collaborating) company, a product or a service are different in the general approach
- Having only text as an entry point for the search might not be sufficient

Design decisions:

- Differentiate between search types for a product, service or company
- Add category selection (similar to publishing)
- Allow for more advanced search functions (e.g. directly interacting with underlying taxonomies)

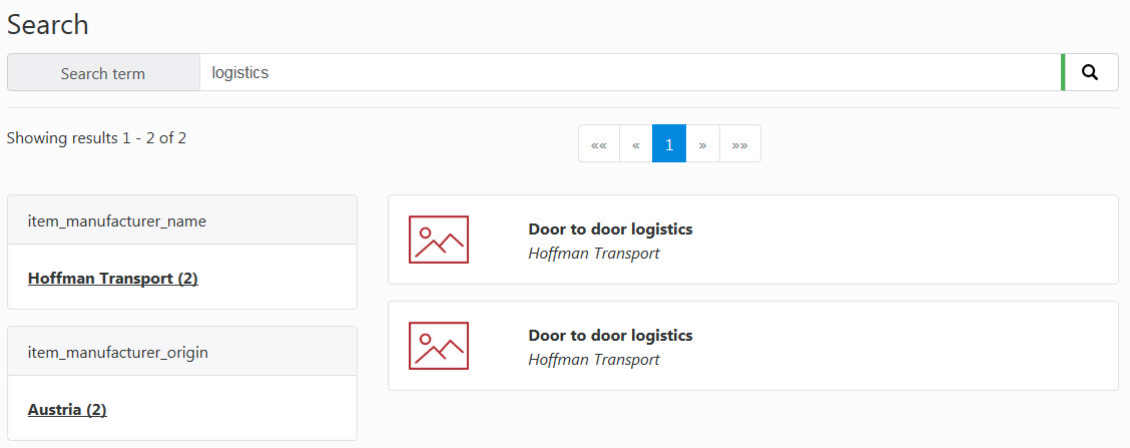

Figure 11 – Text-based search (first release)

Note: For the first release a text-based search with facet filtering was employed for products and services only. More advanced search types (e.g. an "explorative" search) are currently being developed and will be part of future releases.

4.5 Business Processes

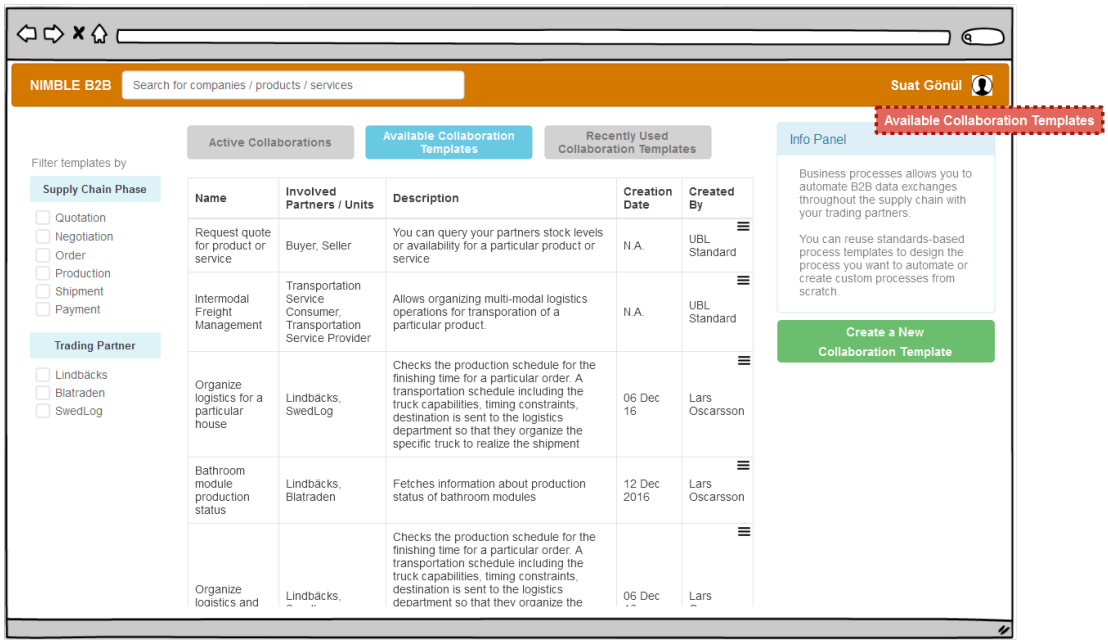

Figure 12 – Business process template selection

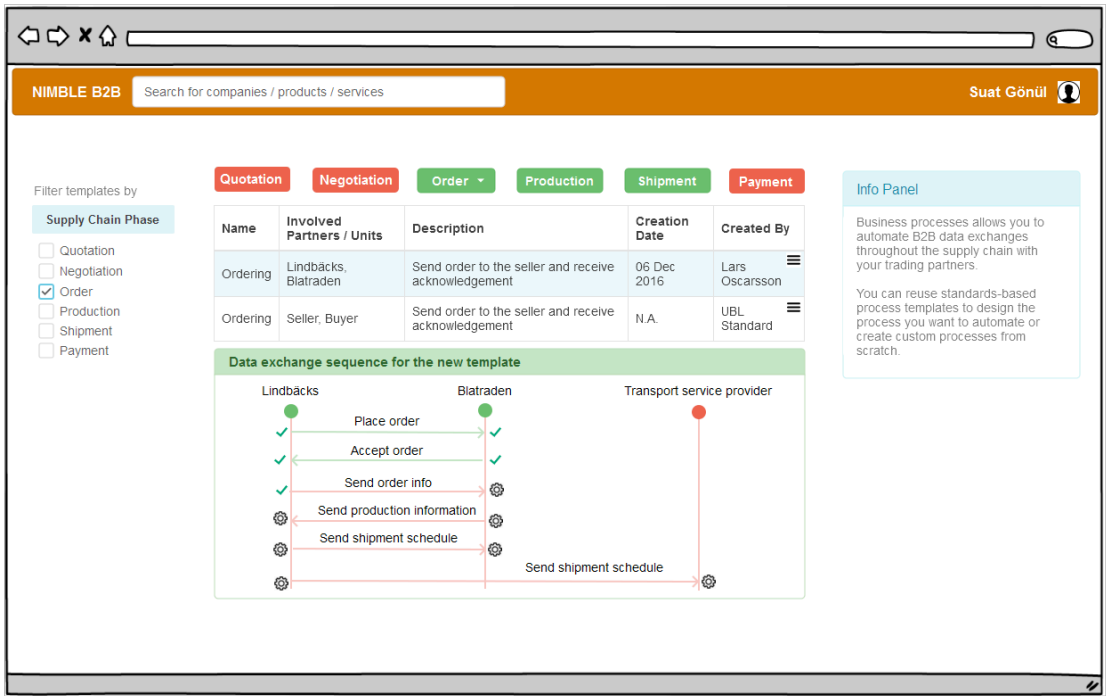

Figure 13 – Business process modelling

The business processes were designed to be selectable from a predefined list in addition to public templates provided by other platform users (this is in line with the general crowdsourcing approach). Furthermore, those processes were supposed to be manageable and adjustable via a modelling interface.

User feedback:

- Configuration of processes seems very complex upon first sight
- In many cases existing processes are already in place and basic communication channels are sufficient

Design decisions:

- Basic business processes (e.g. order, negotiation, etc.) can be predefined and should be executable on the platform without endpoint definitions by direct user input (i.e. without involving external data management systems)
- A simple process should be available in order to exchange documents/messages between companies via the platform in case more advanced processes are executed outside of NIMBLE

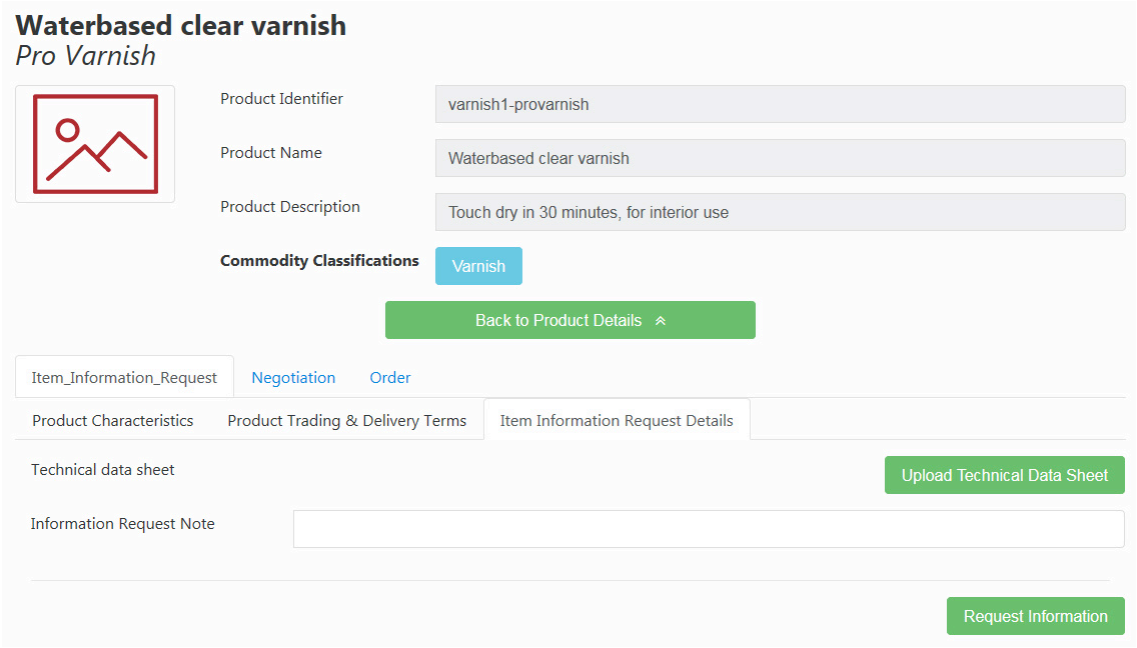

Figure 14 – Business process execution (first release)

Note: Predefined business processes can be accessed and executed via the dashboard (active processes) and the product/service details page (new processes). The modelling of custom processes is on hold for the time being but will be re-addressed after gaining more user feedback.

5 UI Implementation

The actual UI implementation is part of T3.7 and will be reported in the respective deliverable. Nonetheless, some of the general implementation decisions affect the UX design and are therefore reported in this chapter.

The whole platform UI is being implemented using Angular[6]. This decision was made because of the following reasons:

- Angular offers offline support using HTML5 from scratch. This allows for seamless support of mobile browsers
- The TypeScript codebase can be deployed to native mobile or desktop apps without much effort
- Angular is highly performant due to template based code generation and component based code splitting
- Due to code injection created templates and services can be reused throughout the whole platform. This ensures a unified look and feel

In general, Angular is currently the most used web framework, completely open-source and powered by Google – thus it is definitely future-proof. Furthermore, the package management via the Node Package Manager[7] and the unit tests using Karma[8] allow for highly automated code maintenance across all browsers.

[6] https://angular.io
[7] https://www.npmjs.com
[8] https://karma-runner.github.io/1.0/index.html

6 Conclusion

All in all, it is vital to act according to an iterative, user-centered design process in order to tailor a platform to the needs of all (or at least a vast majority of) users instead of just the ones considered during the analysis and design phase. Thereby, a variety of usage scenarios and system paths have to be covered addressing all relevant user types.

Elaborate processes, guidelines, frameworks and tools are available and should be used for the purpose of optimizing the UX design and the associated platform usability and perception. Especially during the implementation phase it is crucial to stick to a holistic approach while maintaining release cycles driven by user feedback and feature evolution.

Due to the nature of iterative design this deliverable only reported on the applied methods and state of development of the first platform release (December 2017). Alterations and additions will be applied and reported in deliverable D3.7 along with a more holistic view and outlook on future releases.

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