



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



## D7.2 Value Proposition of NIMBLE for the Eco Houses Supply Chain

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## Abstract

The EcoHouse B2B platform is an adaptation of the generic NIMBLE-platform with the common objective to achieve a number of value propositions, such as a significant reduction of purchase order costs based on faster and more reliable information exchange. The development of the platform has been accompanied by a number of validation workshops, which have been carried out in close collaboration with many suppliers of LINDBÄCKS and PODCOMPS business networks. In these workshops, the functionality of the platform, but also the potential value proposition of the EcoHouse B2B platform have been assessed. In addition, the standard usability scale (SUS) has been determined and IT-design students of the technical University of Lulea (Sweden) have carried out an assessment of the platform.

The deliverable summarises the performed tests, describes the applied methodologies, presents the obtained results and concludes with an outlook and next steps in the development of the EcoHouse platform.

## Document History

Version	Date	Comments
0.1	12-18-2019	First structure
0.2	01-07-2020	Workshop descriptions added
0.3	01-15-2020	Added chapter on students test
0.4	01-20-2020	Add results of the latest platform test
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# Acronyms

Table 1: Acronyms table

Acronym	Meaning
LTU	Lulea Technical University
MVP	Minimal viable product
LCPA	Life cycle performance assessment
SUS	System usability scale
UI	User Interface
UX	User Experience

# 1 Introduction

The EcoHouse B2B platform has been adapted with the objective to achieve a number of value propositions, such as a significant reduction of purchase order costs based on faster and more reliable information exchange. The development of the platform has been accompanied by a number of validation workshops, which have been carried out in close collaboration with suppliers of LINDBÄCKS and PODCOMPS business networks. In these workshops, the functionality of the platform, but also the potential value proposition of the EcoHouse B2B platform has been assessed. In addition, the standard usability scale (SUS) has been determined and IT-design students of the technical University of Lulea (Sweden) have carried out an assessment of the platform.

Therefore, this deliverable starts with a short introduction to the EcoHouse platform and the expected value propositions. The supplier workshops are described in terms of applied methodology and participants in chapter 3. The results of the workshops are summarised in overall four future scenarios, which represents for each EcoHouse stakeholder type, the expected outcome, identified barriers and opportunities for future development. Chapter 3.3 addresses the performed standard usability scale questionnaire and discusses the obtained results, before chapter 5 describes the platform tests and results of the IT-design students from LTU. The last chapter draws the conclusions of the validation activities.

## 2 The EcoHouse-platform

### 2.1 Introduction

The EcoHouse-Platform has been initiated to customise the NIMBLE-MVP to the requirements of the Swedish construction industry. Thereby the customisation includes the addition of Swedish Crowns (SEK) as currency, the Swedish language option, minor changes in the front-end visualisation, and the implementation of an extended furniture ontology to categorise the products and services offered on the EcoHouse platform. The latter is due to the fact that there is no existing ontology-standard regarding the construction industry. This is unfortunate but a fact that is acknowledged by the industry.

The EcoHouse-platform has been set up by project partner University of Bremen and runs on their servers in order to gain experiences and testing the set up process of an additional instance of NIMBLE. Moreover, a customised version of NIMBLE-MVP could attract more interested third parties of the Swedish construction industry for platform demonstrations.

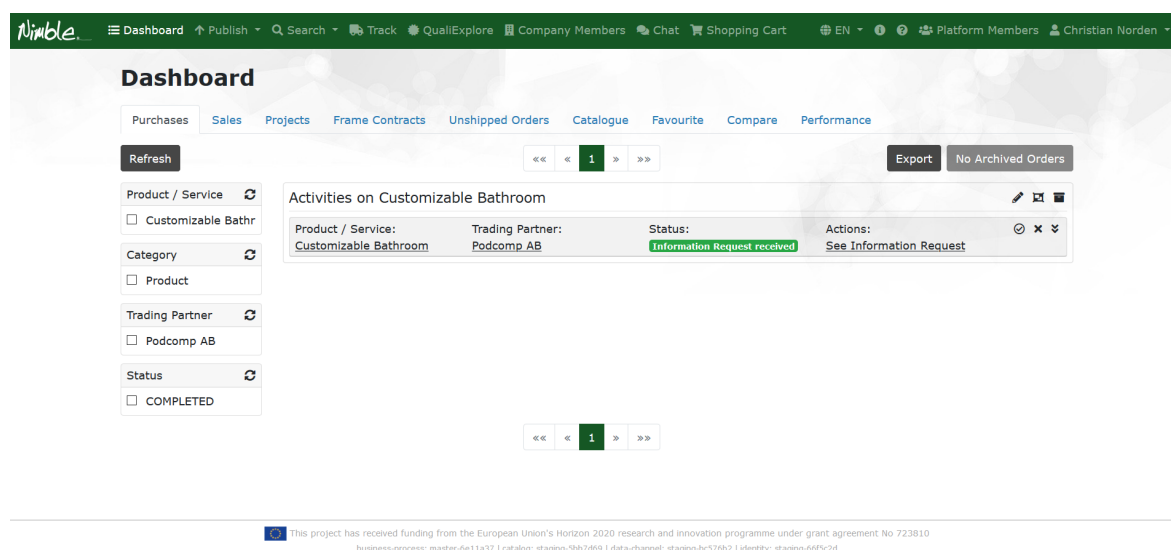


Figure 1: The dashboard of the EcoHouse platform



## 2.2 Expected value proposition

Based on the experiences in their business relationships, LINDBÄCKS and PODCOMP have defined platform goals, how a B2B platform could provide value to companies in the LINDBÄCKS-supply chain and to companies of the Swedish construction industry. Table 2 summarises the platform goals and the corresponding expected value proposition.

Platform Goals	Expected value proposition
Transparent and faster order handling	Speed up the procurement process, resulting in an average reduction of cost of purchase order
Improved supply chain efficiency by better, faster and less redundant information exchange	
Easy and fast way to customise individual supplier products	Reduce the time to sell/order customisable products and thereby optimise the cost per purchase- or selling process
Order process automation of customizable supplier components for houses by configurators	
Continuous quality improvement by better traceability throughout the product life cycle	Gain knowledge about the product/service Enable and ease failure detection and product improvements.
Process monitoring along the value chain	Reduction of reaction times and – costs in case of deviations
Establish new maintenance services/business models based on smart technologies	Expanding business areas of EcoHouse-users
Consider life cycle properties in the purchasing process	Assuring a sustainable products throughout the supply chain

**Table 2: Platform goals and corresponding value proposition**

### 3 EcoHouse platform validation

The validation of the value proposition in the EcoHouse use-case is based on three areas:

1. Workshops with supplier companies of the LINDBÄCKS supply chain (including PODCOMP)
2. Standard usability scale (SUS) survey among the workshop participants
3. Student tests at LTU

We performed all tests with the EcoHouse instance or the same version of the MVP (in cases where bugs prevented the use of the EcoHouse instance).

#### 3.1 Validation workshops with suppliers

##### 3.1.1 Test workshops with suppliers of the EcoHouse-use case

In order to validate the expected value proposition of the NIMBLE-platform (see chapter 2.2), LINDBÄCKS and PODCOMP have invited companies of their supply chain to a number of workshops.

In these workshops, the NIMBLE platform was introduced to the participants and the functionalities were demonstrated. In the test itself, real-life business processes were mimicked on NIMBLE to test its functionality. Afterwards, several personal interviews with the participants were carried out in order to assess the NIMBLE-approach and to evaluate the value proposition of a B2B platform in general, and of NIMBLE specifically. The workshops were scheduled in accordance to new platform releases to assure to test the latest version of NIMBLE in terms of features and functionality.

The first workshop was held on June 7<sup>th</sup>, 2017 at LINDBÄCKS, in which 11 companies of the LINDBÄCKS supply chain attended. 7 of the 11 companies were represented by their CEO, which underlines the general relevance of the topic (see also Table 3). In the workshop itself, the NIMBLE-concept and the current version of the NIMBLE Platform were presented, which was in an early stage of development. Afterwards the potential of B2B platforms was discussed among the participants.

Company	Position of participant	Products
Artic-Kvartsit	CEO and purchase manager	Stone material
Gustavsberg	Project Manager	Toilets
Martinsons	Project Manager	Wooden studs
Älvsby Ytbehandling	Project Manager	Painting
Space	CEO	Bathroom furniture

RK-Teknik	CEO	Steel to balconies
Compositbalkonger i Fällfors	CEO	Balconies
Form 1	CEO	IT Consultant
Lundkvist Trävaru AB	CEO and purchase manager	Carports
RISE interactive	Researcher	Consultant
Trisco Specialsnickeri AB	CEO	Joinery, Kitchen

**Table 3: Participants of the first workshop in 2017**

After the release of the MVP-version of the NIMBLE platform and the initiation of the EcoHouse platform as an instance of the MVP, a second workshop with LINDBÄCKS and PODCOMP supplier was scheduled. Some of the participants of the second workshop joined the first workshop in 2017, three participants were introduced to the EcoHouse/NIMBLE-platform for the first time. Table 4 gives an overview about the participants.

Company	Position of participant	Products
Artic-Kvartsit	Purchase manager	Stone material
Compositbalkonger i Fällfors	CEO	Balconies
Oras	Purchase manager	Valves
Vindelåns snickeri	Product manager	Joinery
Svensktkakel.se	Product manager	Tiles
PODCOMP	Purchase manager	Bathroom modules
LINDBÄCKS	Purchase manager	Pre-fabricated, multilevel wooden houses
LINDBÄCKS	Digitization Manager	Pre-fabricated, multilevel wooden houses
LINDBÄCKS	IT-Manager	Pre-fabricated, multilevel wooden houses

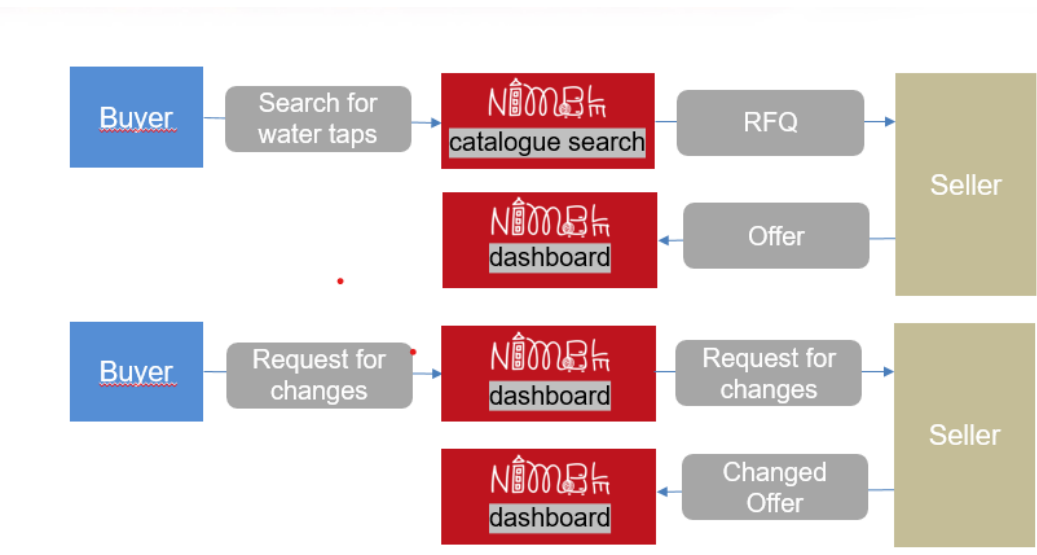
**Table 4: Participants of the second workshop in September 2019**

In the workshop, the participants were introduced to the EcoHouse/NIMBLE-platform-release 12.0 in a presentation before a hands-on platform validation session started. Thereby, the participants were grouped into Buyer and Seller (see Table 5).



**Table 5: Grouping for the hands-on platform validation**

In the next step, the workshop participants simulated typical business processes on the EcoHouse/NIMBLE platform according to predefined test scenarios (see Figure 2). For example, one test scenario focused on the ordering process as a core-service of NIMBLE: Thereby the participants used the search function to find specific products and started the ordering process with information requests, before several rounds of negotiation were mimicked. Finally the product was ordered, which ended the test scenario. These kind of test scenarios were developed for each workshop according to the new features of the platform releases and the associated test focus.



**Figure 2: Test-scenario example of the workshop**

The active involvement of the stakeholders in the test process enabled them to discuss the NIMBLE-platform approach and to give valuable feedback for the platform.



**Figure 3: Second supplier workshop at LINDBÄCKS**

An additional testing round with suppliers was scheduled on October 28<sup>th</sup> 2019 to test the platform release-version 13.0 of the EcoHouse/NIMBLE-platform and gather additional feedback. Thereby the approach of applying predefined business processes, mimicking real-life business process at LINDBÄCKS was applied again. Table 6 gives an overview about the participants.

Company	Position of participant	Products
LINDBÄCKS AB	Project manager	Pre-fabricated, multilevel wooden houses
LINDBÄCKS AB	Purchase manager	Pre-fabricated, multilevel wooden houses
Podcomp	Purchase manager	Bathroom modules
Oras Ltd.	Purchase manager	Valves
Oras Ltd.	Digitalisation manager	Valves

**Table 6: Participants of workshop 3**

Based on the gathered feedback of the workshop, new functionalities like the shopping cart and frame contracts have been added to the EcoHouse/NIMBLE-platform release 14.0. In order to test the new functionalities and to gather additional feedback from suppliers, a new workshop was organised on January 21<sup>st</sup> 2020. The test scripts for the platform were adapted according to the focus of the test and a lengthy feedback round was scheduled in the agenda.

Company	Position of participant	Products
LINDBÄCKS AB	Purchase manager	Pre-fabricated, multilevel wooden houses
Podcomp	Purchase manager	Bathroom modules
Vindelåns snickeri	Product manager	Joinery, doors
SSC group	CEO	Building components
SSC klingan	Purchase manager	Building components

**Table 7 Participants of workshop 4**

Overall, 18 different suppliers of LINDBÄCKS and PODCOMP participated in the workshops, tested the NIMBLE-platform in hands-on sessions and provided valuable feedback in interviews or in the SUS survey (see chapter 3.2).

### 3.1.2 Future scenarios for NIMBLE improvement and adoption

The results of the supplier interviews during the workshop were summarised and transferred into 4 future **value-proposition scenarios**:

1. The purchase manager
2. The sales manager
3. The EcoHouse building manager
4. The service provider

Thereby, each scenario-description addresses expected value propositions. Table 8 gives an overview of the manner in which the expected value propositions are mapped to the scenarios.

Expected value proposition	Corresponding Scenario
Speed up the procurement process, resulting in an average reduction of cost of purchase order	Scenario 1 and 2
Reduce the time to sell/order customisable products and thereby optimise the cost per purchase- or selling process	Scenario 1 and 2
Enable and ease failure detection or improvement opportunities. Gain Knowledge about the product/service	Scenario 3
Reduction of reaction times and – costs in case of deviations	Scenario 3
Expanding business areas of EcoHouse-users	Scenario 1-4
Consider life cycle properties in the purchasing process	Scenario 1,2 and 4

**Table 8: Mapping of expected value proposition and Future scenarios**

SCENARIO	Nr. 1	The EcoHouse purchase manager
DESCRIPTION: My company builds prefabricated, modular wooden houses. We build up to 12 stories. We build our houses across Sweden, but the Stockholm area is a specific hotspot. Our business is growing significantly. As a result, the amount of intermediate products we buy has increased and the purchase order costs become more relevant for the profitability of our business.		
DEGREE OF INTERNAZIONALIZATION: beginner (fewer foreign suppliers)		
EXPECTED USE OF THE PLATFORM	The platform would become the key application in the daily work of the procurement.	
REASONS OF USE	<ul style="list-style-type: none"><li>○ Transparent and faster order handling</li><li>○ Improved supply chain efficiency by better, faster and less redundant information exchange</li><li>○ Easy and fast way to customise individual supplier products</li><li>○ Order process automation of customizable supplier components for houses by configurators</li><li>○ Find additional potential suppliers</li><li>○ Looking for sustainable intermediate products</li></ul>	
EXPECTED OUTCOME	Significant time- and cost savings in the purchasing management through faster and more reliable information exchange and an easier way to order customised products.	
BARRIERS		
<p>So far the platform lacks technical and functional reliability. The test-sessions in the workshops identified bugs and problems on a regular basis. The UI is rather complex and needs time to get familiar with – this is not primarily considered as a problem but a fact. In the current version, the lack of a connection to internal ERP-systems and the way the ordering process is designed and works is considered to be too complex and does not ease the way to trade with customisable products. As a result, the ordering process is assessed to be time consuming and it will be hard to convince a critical mass of users to gain the necessary networking effects of a platform.</p>		
OPPORTUNTIES		
<p>Further development of the following aspects could lead to an improved value proposition:</p> <ul style="list-style-type: none"><li>○ Reliable technical functionality</li><li>○ Potential UI improvements</li><li>○ Tailoring and improving the ordering process</li></ul> <p>A connection to internal ERP-systems of platform users would be an individual implementation work that differs for each ERP-system. Therefore, such a connection can only be established by a dedicated software-developer assigned by the individual platform user.</p>		



SCENARIO	Nr. 2	The Sales manager
DESCRIPTION: Our company produces highly customisable doors for large building projects like hospitals. We are supplier of building companies like LINDBÄCKS. The ordering process of our products is very time-intensive based on the customisable options.		
DEGREE OF INTERNAZIONALIZATION well-established		
EXPECTED USE OF THE PLATFORM	On a daily basis	
REASONS OF USE	<ul style="list-style-type: none"><li>○ Easier and faster way to handle orders of customizable products</li><li>○ Expanding our market by identifying new potential customers on the B2B Platform</li></ul>	
EXPECTED OUTCOME	<ul style="list-style-type: none"><li>○ Massive time- and cost savings thanks to easier and faster order handling of customisable products</li><li>○ Establishing new business relationships</li></ul>	
BARRIERS		
So far, the technical performance of the platform is not reliable in the test-workshops. The presented ordering process on NIMBLE seems to offer no time-savings at all, when I compare it to our current process of order handling by E-mail and telephone. Especially the functionality to handle the ordering process of customisable products. I.e. choice of colour, design, glass parts, sound and fire protection and locking systems, is limited and does not allow visualisation of the customised product (Photo, 3-D model).		
OPPORTUNITIES		
To offer the expected value proposition, the platform should address the following topic in the further development:		
<ul style="list-style-type: none"><li>○ Increase the technical reliability</li><li>○ Improved support of customisable products including visualisation options</li><li>○ Accelerate the ordering process to realise time savings</li></ul>		

C	Nr. 3	The EcoHouse building manager
<b>DESCRIPTION:</b> My company builds prefabricated, modular wooden houses. We build up to 12 stories. We build our houses across Sweden, but the Stockholm area is a specific hotspot. Our business is growing significantly. As a result, the amount of intermediate products we buy has increased and the purchase order costs become more relevant in our processes.		
<b>DEGREE OF INTERNAZIONALIZATION:</b> well-established		
<b>EXPECTED USE OF THE PLATFORM</b>	The platform would be used to track the production/delivery status of intermediate products and to gather quality information throughout the lifecycle (e.g. usable for settling damage cases), we also need to handle reclamations continuously as part of daily work.	
<b>REASONS OF USE</b>	<ul style="list-style-type: none"><li>○ Traceability throughout the product life cycle</li><li>○ Process monitoring along the value chain</li></ul>	
<b>EXPECTED OUTCOME</b>	<ul style="list-style-type: none"><li>○ Continuous quality improvement based on traceability of components</li><li>○ Faster identification of failures and a reduction of associated repair costs</li></ul>	
<b>BARRIERS</b> Tracking and Tracing services have been implemented and successfully tested within the project by LINDBÄCKS and PODCOMP. However, there is no experiences in terms of upscaling the process and to what extend the expected benefits of the services can be utilised, especially concerning the corresponding investment costs.		
<b>OPPORTUNITIES</b> Establishing the value added service by enlarging and prolonging the test-scenario with the long-term objective to prove the associated value proposition of the service.		

C	Nr. 4	The service provider of value added services
<b>DESCRIPTION:</b> We are offering environmental footprint and life cycle cost estimation on NIMBLE. Companies can order our services in order to differentiate themselves on the B2B marketplace.		
<b>DEGREE OF INTERNAZIONALIZATION</b> well-established		
<b>EXPECTED USE OF THE PLATFORM</b>	On a daily basis	
<b>REASONS OF USE</b>	Offering our life cycle analysis service on NIMBLE-Instances to expand our market for service.	
<b>EXPECTED OUTCOME</b>	Companies can order the service to advertise their products/services as sustainable. The results would be displayed as product properties and may improve sales based on the results of the life cycle analysis.	
<b>BARRIERS</b> A threat for a profitable business for the platform provider and the value-added services and is the dependency on a critical mass of users. Therefore the core-services in conjunction with value-added services need to provide a strong, common value proposition to attract platform users. In that sense, platform provider and value-added services provider rely on each other.		
<b>OPPORTUNITIES</b> The integration of external tools to offer value-added services on the NIMBLE-platform via the webservice is flexible and easy to apply. As a result, additional value added services could be integrated with reasonable effort to attract more users. Vital platform development in terms of user with a particular focus on sustainable products is crucial to create business opportunities.		

### 3.2 System usability Scale (SUS)

In addition to the platform testing workshops, the standard usability scale (SUS) questionnaire has been distributed among the workshop participants of workshop 2,3, and 4 in order to evaluate the usability of the EcoHouse/NIMBLE-platform. In addition, applying the SUS allows to compare the results among the use-case partners in WP 7 (see for example the results of the SUS for the textile use-case documented in D 7.3).

Fragen Antworten 0 Gespeichert

ECOHOUSE SUS

1. I think that I would like to use the Ecohouse platform frequently. \*

☐ Strongly Disagree

☐ Disagree

☐ Neutral

☐ Agree

☐ Strongly agree

2. I found the Ecohouse platform unnecessarily complex \*

☐ Strongly disagree

☐ Disagree

☐ Neutral

☐ Agree

☐ Strongly agree

**Figure 4: An excerpt of the SUS questionnaire**

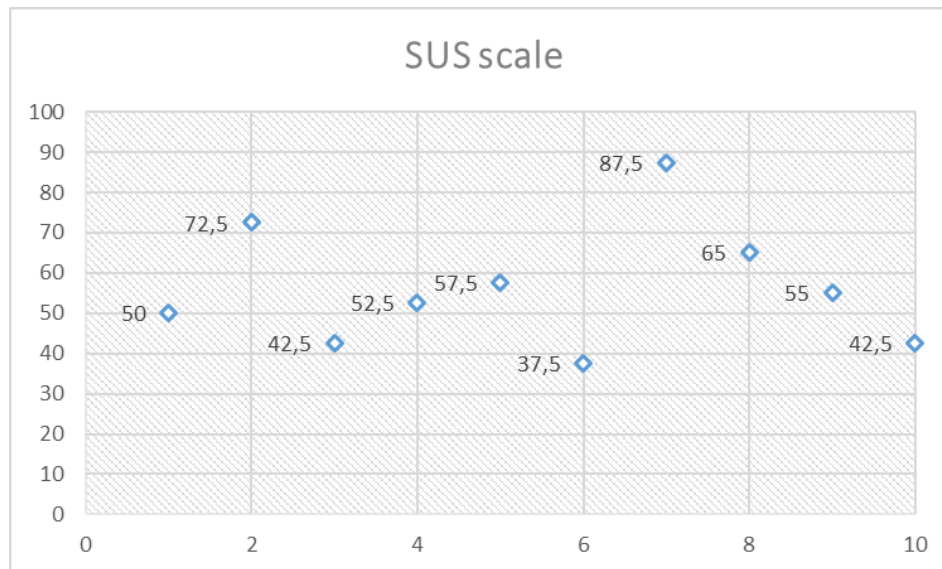
In the SUS, the answers range from Strongly Disagree, Disagree, Neutral, Agree to Strongly Agree and are scored from 1 to 5. The scoring is used to calculate the SUS score, which are interpreted as follows (see Figure 5):



**Figure 5: The SUS scale**

In total, 10 participants filled in the SUS questionnaire. The results show an average SUS-score of 56,25. According to the SUS-scale the usability of the EcoHouse platform is rated as medium. Looking at the distribution of the SUS scale, platform users have scored

very differently (see Figure 6), ranging from 42,5 as the lowest score to highest score of 87.5.



**Figure 6: SUS Scale for the EcoHouse platform**

The medium SUS-score is very well represented by the answers about how easy the EcoHouse/NIMBLE platform is to use (see Figure 7) and confirms the mixed experience of the workshop participants (see chapter 3.1.2).

### 3. I thought the Ecohouse platform was easy to use

#### [Weitere Details](#)

Strongly Disagree	0
Disagree	2
Neutral	4
Agree	2
Strongly agree	0



**Figure 7: SUS-Results to question 3**

Looking into the answers of each question in more detail, it is notable that no one of the respondents would like to use the platform, in the current release, frequently. The best and most selected results for this question is neutral (see Figure 8). Neutral is here impetrated as believing in the concept, understanding that development takes time. The answer is in-line with the results of the workshop -participant interviews, where the reasoning for this assessment is articulated in the scenarios (see chapter 3.1.2).

1. I think that I would like to use the Ecohouse platform frequently.

[Weitere Details](#)

Strongly Disagree	0
Disagree	3
Neutral	5
Agree	0
Strongly agree	0



**Figure 8: Results to SUS-question 1**

Another interesting outcome concerns first time platform users. Half of the respondents felt, they need assistance to use the platform., while 37,5% are neutral about it. Partly related to this answer is that half of the respondents think, that there is too much inconsistency in the current version of the platform (50%, see Figure 9 and Figure 9).

4. I think that I would need assistance to be able to use the Ecohouse platform

[Weitere Details](#)

Strongly disagree	0
Disagree	1
Neutral	3
Agree	3
Strongly agree	1



6. I thought there was too much inconsistency in the Ecohouse platform

[Weitere Details](#)

Strongly Disagree	0
Disagree	0
Neutral	4
Agree	3
Strongly agree	1



**Figure 9: Results to SUS-questions 4 and 6**

### 3.3 Validation of Nimble by students

For the validation of the Lindbäck's instance (Eco House use case) of NIMBLE, we involved students from two bachelor programmes Digital Service Innovation and Systems Science at the Luleå University of Technology. The student validation was carried out as an assignment in the course *Design of IT*.<sup>1</sup>

Both programmes are offered as campus *and* distance education, and this mix of campus and distance students result in classes that exhibits big differences and heterogeneity when it comes to the students' age, gender, background and experiences. About 50% of those attending the programmes are also working part time, many of them in IT-related professions, but naturally, the approximately other 50% of the students comes directly from secondary high school.

What the students have in common, attending programs educating in Information and communication technologies (ICT), is a genuine technological interest and good technological skills, some are even already skilled programmers. They are driven in using ICT, the Internet and digital platforms and they belong to the generations that have grown up with ICT as a natural part of work, education and private life.

#### 3.3.1 The assignment

In total 73 students performed the validation, during weeks 47-48, 2019. The instructions they got were:

1. Read about NIMBLE on the project website
2. Find and read scientific articles about B2B platforms that describe B2B platforms aims and specifics
3. Create groups and distribute roles (supplier, manufacturer, logistics company)
4. Validate the EcoHouse-instance of the NIMBLE platform as a group
5. Hand in the validation as an individual assignment

For the validation of NIMBLE *per se*, the students were instructed to analyze and validate based on usability criteria and UX criteria. Taken together the validation on these criteria indicates whether NIMBLE answers to good design, since good design is the overarching goals that taken together indicates the quality of the product. In essence, the product should be easy to learn, effective to use, flexible (in the sense of possible to use in different ways depending on situation) and the product should be possible to use with a good attitude (Arvola 2014). However, what constitutes good design requires taking into account the situations where the products are used, together with the intentions and expectations the situations carries along. In addition, defining good design embraces also

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<sup>1</sup> The course plan is found here: <https://www.ltu.se/edu/course/100/I0006N/I0006N-Design-av-IT-1.68249?kursView=kursplan&l=en>

the consideration of laws and regulations, agreements etc. vital for the product and its use. In addition, issues of democratic, cultural, environmental nature may also play a role (Löwgren & Stolterman 2004).

**Usability** “refers to ensuring that interactive products are easy to learn, effective to use and enjoyable from a user perspective” (Preece et al 2016, p. 42, our translation). Broken down the usability goals are<sup>2</sup>:

- Effective to use (effectiveness); how good is the product to do what it is supposed to do
- Efficient to use (efficiency); the way a product supports the users in carrying out their tasks
- Safe to use (safety); whether the product protects the user from dangerous conditions and undesirable situations
- Having good utility (utility) the extent in which the product provides the right kind of functionality
- Easy to learn (learnability); how easy the product is to learn to use (Preece, Rogers & Sharp, 2016)

Usability goals is a precondition for the quality of the user’s experience (UX), hence usability and UX are connected in the way that UX build on usability.

**User experience (UX)** puts focus on the (subjective) emotions and felt experiences the user gets when using the interactive product. As such UX goals covers many channels, since how the user perceives something might also be influenced by that which is outside the interactive product itself, e.g. how the user is introduced to the interactive product (through friends, colleagues, advertisements...), and the registration and set up of an account, before actual use of the interactive products services and functions. Overall, as a designer the challenge is to create preconditions for desirable user experiences, (e.g. satisfying, engaging, pleasurable, motivating) while avoiding undesirable aspects (e.g. frustrating, annoying, unpleasant, making the user feel stupid) (Arvola 2014; Preece et al 2016).

### 3.3.2 Results

Below the results from the students’ validation are presented, in accordance with the criteria used, starting with the usability criteria, followed by user experience (UX).<sup>3</sup> The ideas, suggestions and errors identified by the students during their validation was reported to the NIMBLE system developers in December 2019.

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<sup>2</sup> Memorability is left out, since it requires using the analysed system after not having used it for some time – here the students would have had to guess, hence we do not address memorability in this validation.

<sup>3</sup> All citations stem from the students assignments, and are translated from Swedish.



### 3.3.2.1 Effectiveness

As NIMBLE is now, the students argue that overall the platform accomplishes what it claims to, while still having potential for improvements. They also notice that NIMBLE primarily offers functions supporting buy/sell transactions, while functions and tools for collaboration is still to be developed. This further means that although many functions are in place, these could be differently designed. One example of this is that *“The prevailing theme is that all information is to be inserted according to the system’s format and description tools. This is an archaic solution. It would have been considerably more easy to provide the users the possibility to tag their information with e.g. ready set XML-tags for to be able to use existing documentation. There should be ready-made APIs that make possible the connection of different actor’s systems to the platform.”*

### 3.3.2.2 Efficiency

When it comes to whether and how the platform supports the users in their tasks, the student identified some vital functions or design issues that would improve the efficiency of the platform. The students specifically mentioned feedback, error prevention, logic and time saving.

Feedback is vital for a platform to be perceived as efficient and supporting. If something happens, the user should get the information needed from the platform, in order to be able to proceed. There are several examples from the students, where they lack feedback, e.g.: *“I tried to publish different transports at the same time, something the platform do not allow. It was irritating that I did not get any message that this was not allowed, it was simply not possible to proceed.”* Also feedback in the form of confirmation notifications are preferable *“When entering ‘save and continue’ the product was really saved, but as a user I did not receive any feedback”* and *“A confirmation notification would be good, ‘Are you sure you want to order this?’ or something like that. As is now, I risk sending something off by mistake.”*

For platforms to support users, error prevention is preferable, e.g. *“If you misspell you don’t get any results at all”* Another example of error prevention is *“Too easy to continue without having filled in all required information. The platform should provide a notification of this. For me, products were published without specifications such as size, weight, etc. it should be more obvious, a ‘next’ button would be preferable.”*

The students also noted that the platform sometimes could improve its logic, e.g. *“When searching for a specific company it ended up on page 2 – this is not logical.”* When searching for specific things, it should end up first of all alternatives. Platforms must be designed in accordance with established design principles, i.e. in line with how people are used to do, what they are used to meet (what they expect) and in line with humans’ way of reasoning.

Lastly, saving time is an important contribution to efficiency. Here the platform has much potential for improvement. As one students expressed it: *“Nothing in the ordering process is automated. This is the most important module for potential users, and it should build on time saving incentives that should be much faster than manual handling.”* Another example of functions that save time for the user is data reuse, e.g. *“When tracking an order I’m asked to write the SGTIN-id. This should not be necessary when I’ve done the purchase through Nimble, the platform should pick up this id.”* Generally, when possible the user should not have to fill in the same data twice.

### 3.3.2.3 Safety

Safety in NIMBLE needs to be improved. For B2B platforms, this is vital. The following comments from students are alarming and need attention in the continuous development of NIMBLE: *“The first I noticed was that when I had logged in to Nimble and then left the computer for more than 24 hours, I was not automatically logged out.”* The other citation concerns change of password for the account: *“... it was possible to choose ‘auto fill’ the old password when trying to change the password. This is a security issue – it makes it possible for unauthorized persons to change password very easily”* Considering that humans are the greatest security threat for organizations and companies, the platform must be designed to prevent user errors as much as possible. Automatic log out is one such function. If a user does not log out when leaving her computer, it becomes a matter of security – anyone passing by can manipulate the content in the computer. This of course concern all content (mail and any other program the user has installed) still, NIMBLE would gain by adding automatic log out when not used for a certain time, and to remove autofill of password when the user has asked for a password change.

#### **3.3.2.4 Utility**

Regarding utility, or whether the platform provides the right functions, the students argued that overall this is so. It is possible to publish products, search, for products/services and companies, place orders and negotiate these etc. However, there are functions needed in the platform, which would improve the utility by helping the user to easily reach goals, e.g. the function to be able to save previous searches or possibility to save ‘Favourites’ when it comes to companies and products.

The students also suggested the possibility to adapt the menu or headers depending on a) type of company, and b) what organizational role the user holds. Regarding the latter, it can be of importance for companies to ensure that not all functions are available to all in a company, only to those who act in certain roles. Other functions suggested are, e.g. *“There should be notifications to the buyer of logistics, where the products are for the moment, and whether there are any delays”* and *“It should be possible to sign contracts etc. by e-ID.”*

#### **3.3.2.5 Learnability**

Most students did not have problems regarding learnability. As mentioned earlier, they are knowledgeable in IT in general, and skilled in using various systems, programs, platforms etc. As one student argued, NIMBLE is *“Intuitive for ICT competent persons, but not for those less knowledgeable in ICT.”*

It was pointed out that the Dashboard contains *“18 different tabs leading to different parts of the platform, it becomes confusing for the user how to navigate.”* This implies that the user has to put much effort in learning what each tab represents. A more simple and clean design would be preferable, where the user meets only what is needed for the specific process, in line with *“Decrease the number of tabs on the first page. E.g. one tab ‘Transactions’ could in turn show ‘Purchase’ ‘Sales’ ‘Orders’”* and *“Shopping Cart should be an alternative only once you’re on the buy/sell page.”*

One student summarized this as *“the platform is hard to understand and many concepts and their relations are not explained”* indicating that this is crucial for learnability. The students also noted that there were *“Many error messages but these did not guide me as a user,”* something that adds to that the platform becomes hard to learn.

For learnability reasons, the students suggested an introduction: *“... it would be nice with an explanation what Nimble is, and what it is for on the first page.”*

### 3.3.2.6 User experience (UX)

When it comes to user experience it is worth mentioning that the first impression is important. Examples that show the subjective nature of UX are: *“I’d put some efforts in a more aesthetic design, with better contrasts, to improve the first impression of the platform. Logical placement of parts, and perhaps division of information into chunks. On the first page you should also find guiding information, on how to use different functions”* as argued by one student, while another student meant that *“Aesthetically, Nimble is nicely designed. The platform has many open white spaces, and there is not too much text. The use of color code shows the user what needs to be done in the negotiation process, which gives the user a good overview.”*

In short, currently the students report on too many things as in need of further development, as is seen in the examples above. In addition, *“The platform is not intuitive. The platform is built on the assumption that I as a user already know how it works.”* Thus, we conclude that overall, the platform has a good foundation, however there are still some efforts needed, for the platform to provide a pleasant UX, and answer up to good design.

## 4 Conclusion

The validation activities for the value proposition of the EcoHouse-platform show mixed results. The technical challenges during the supplier workshops slow down the adoption and should be addressed – as indicated in the scenarios – to build more trust in the platform. In addition, the expected value propositions of reducing the purchase order costs significantly, especially for customisable products, are not yet entirely fulfilled. Improving these aspects and designing more accelerators would significantly raise the adoption rate.

On the other hand, the implementation of value added services, like tracing and tracking or life cycle analysis, demonstrated the potential value proposition in the performed case studies. The medium SUS- score reveals potential for improvements in the UI design, although the EcoHouse-platform was not expected to be self-explanatory. More importantly than the overall SUS-score is the statement, that none of the respondents would like to use the EcoHouse platform frequently for their business activities as it is now. The reasoning for the statement is justified by the above mentioned issues identified in the supplier workshops and in general not uncommon for research and innovation activities. Without drawing any conclusion about the total market, the sample indicates that further work is necessary to turn the platform into a viable and reliable product. In addition to the validation of the suppliers, the students testing confirms the mixed picture.

## 5 References

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