



ComVantage

284928

***Collaborative Manufacturing Network
for Competitive Advantage***

**D7.4.1 – Customer-oriented Production
Adaption of Mobile Collaboration Concept
(public)**





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Executive Summary

Deliverable 7.4.1 describes the procedure and the results of the adaptation of the concepts of intuitive and trustful mobile interaction introduced in WP 5. Based on deliverable 7.1.1 the application area *Customer-oriented Production* was chosen for a first adaptation of the generic User Interface (UI) models and workflows. Both the user interface concepts and the generic software architecture have been extended and modified according to a software requirements specification provided by the application partner. All modifications and extensions are closely aligned with the results of the deliverables 7.2.1 and 7.3.1. The Business Evaluation Framework introduced in work package 9 has been adapted to the given application area to allow a first evaluation. As a result of the adaptation process, the deliverable provides a set of recommendations for implementation of the first adapted mockup prototype in work package 11 and a concept for the evaluation of the adapted prototype in work package 5.

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1 OVERVIEW

1.1 Introduction

As introduced in *CV-D5.3.1*, orchestration of mobile apps has its starting point in the selection of suitable generic apps for all involved tasks of a mobile app-supported workflow. As a second step, those generic apps have to be adapted to the requirements of the particular context of use. This adaptation guarantees best-possible suitability for the task and may require more or less effort, depending on this context and the quality of the generic apps. Part of this effort is to be automated, while others will remain manual labour. The concept of app orchestration is going to be realised in the *ComVantage* Industrial App Framework. While App orchestration is a rather universal concept the implementation needs to be adapted to specific needs of the application area Customer-oriented Production.

1.2 Scope of this Document

The purpose and scope of this document is the description of the procedure and the results of the adaptation of the concepts of intuitive and trustful mobile interaction introduced in work package 5 to the exemplary application area of work package 7 *Customer-oriented Production*. The content of this document shall serve as foundation for the implementation of the mockup prototype, its validation and usability evaluation. It shall further advance the development of the Business Evaluation Model.

1.3 Related Documents

The software requirements specification is based on the Initial set of requirements based on exemplary scenarios and use cases introduced in D2.1.1: *Functional and Technological Requirements* and the first selected scenarios and use cases elaborated in D7.1.1: *Customer-oriented Production – Scenario Specification and Refinement*.

The evaluation concept is based on the preliminary version of the usability & trust metrics toolkit introduced in D5.1.1: *Metrics for Usability and Trust*.

The application area specific adaptations of the User Interfaces mainly refer to the basic presentation and workflow models introduced in **D5.2.1: UI Presentation and Workflow Models**.

The application area specific adaptations of the software architecture mainly refer to the generic concepts and the runtime framework introduced in **D5.3.1: UI Modelling and Generation Framework**.

All modifications and extensions have been closely aligned with the results of the deliverables D7.2.1: *Customer-oriented Production – Adaption of Secure Information Model Concept* and D7.3.1: *Customer-oriented Production – Adaption of Linked Data Integration Concept* which were created in parallel. Further, care was taken to preserve the greatest possible consistency with the deliverables D6.4.1: *Plant Engineering and Commissioning – Adaption of Mobile Collaboration Concept* and D8.4.1: *Mobile Maintenance – Adaption of Mobile Collaboration Concept*.

The application area specific adaptations of the Business Evaluation Framework are based on the conceptual evaluation framework introduced in D9.1: *Evaluation Framework* and mainly refer to the set of relevant metrics and their definitions for this framework that have been introduced in D9.2.2: *Multidimensional Metric Set*.

This deliverable will serve as a foundation for the implementation of the mockup prototype in D11.2.1: *Prototypical Implementation of Customer-oriented Production*, and for the usability evaluation of this prototype in D5.1.2: *Metrics for Usability and Trust*. It will further have direct impact on the development of



the simulation model for comparing alternative *ComVantage* processes in D9.3.1: *Simulation Analysis Report*.

2 ADAPTION OF THE GENERIC CONCEPTS OF CUSTOMER-ORIENTED PRODUCTION

2.1 Software Requirements Specification

With respect to the first prototype supporting the Customer-oriented Production application area we chose the following scenarios with selected use cases, covering both the customers' and the producers' view from *CV-D7.1.1* and the corresponding requirements with respect to the intended user interfaces:

- Standard Web Shop Order and Custom Order/Tailor made Scenario (*CV-D7.1.1*, page 30)
 - Use Case #2 Standard Web shop Order
 - Use Case #10 Order of Individual Shirt Design
 - Use Case #11 Order of Embroidered Shirt
- Flexible Production Environment Scenario (*CV-D7.1.1*, page 34).
 - Use Case #6 Production of Shirt Parts
 - Use Case #21 Reduction of Transportation Distances

For this deliverable the selected scenarios do not cover all use cases stated in the *CV-D7.1.1*. The intention is more to pick out examples along which the adaptation of the generic concepts and user interfaces can be shown.

The requirements we draw from the scenario have references to the respective requirement in the *ComVantage* FusionForge requirements entry (e.g. Requirement_###).

2.1.1 Use Case #2 Standard Web Shop Order

- Customer accesses mobile web shop
- Customer selects collection
- Customer selects women/men
- Customer selects shirt model
- Customer selects colour
- Receives accessories recommendation
- Optionally selects embroidery
- Customer selects size and amount of shirts
- Customer selects price range, distance to producer and preferred delivery date
- Customer puts item (shirt model) into shopping cart
 - Further sizes and their amount can be selected (in a dropdown menu for instance)
- Customer checks out
- Customer logs in or is logged in automatically via cookie or social network
- Personal data is automatically taken from profile
- Customer approves delivery address
- Customer selects notification level (high, low, none)
- Customer selects notification type (e-mail, text message, Facebook message)
- Customer selects payment method
- Customer can jump forward/backward between steps of order process as he likes (by a status bar for instance)
- Customer submits order



- Customer receives order confirmation (including invoice, links to order notification settings)
- System informs appropriate processors (DC21, producer)

Table 1 describes the requirements for the selected Use Case #2:

ID: 313	UseCase: 2	Verified	Prio: 5	WP7
Customer should be able to select different amount/sizes within one shirt model			Usability	
Description: When one customer would like to select one shirt model but in different sizes and amounts (e.g. Shirt model "1", Small: 2 / Medium: 1 / X-Large: 3). This is especially important for companies which would like to order the company shirt for different employees. In this case the customer has to be able to select one shirt, add different sizes and different amounts to each size before putting it into the shopping cart.			Rationale: To ease the selection of different sizes with different amounts when selecting one shirt model. In this case the customer does not have to go backwards/forwards between web shop selection and shopping cart.	
Accept.Crit.: Functionality to specify quantities on shirt model in shopping cart is provided			Conflicts: none	
Cust.Satisf.: Very satisfied			Cust.Dissatisf.: Very dissatisfied	
ID: 314	UseCase: 2	Verified	Prio: 5	WP7
Customer should be able to stay on product page when adding product to shopping cart			Usability	
Description: When a customer adds a product to the shopping cart he should stay on this page. The shopping cart information should be added in a sidebar (which should be possible to hide and view). Then the customer is able to continue shopping without being interrupted by page changes and can decide on his own where to go with the navigation menu.			Rationale: To allow user to stay on a product page instead of being forwarded to shopping cart in case he would like to add more than one product.	
Accept.Crit.: Shopping cart is updated in the background and is only visualised by a sidebar on the webpage. User is able to view cart on request.			Conflicts: none	
Cust.Satisf.: Satisfied			Cust.Dissatisf.: Dissatisfied	
ID: 372	UseCase: 2	Verified	Prio: 5	WP7
Customer has to be able to jump forward/backwards in order process			Usability	
Description: Customer has to be able to jump forward/backwards in order process as he likes (with a status bar for instance) to be able to change previously entered data.			Rationale: To allow customer to change entered data in a previous step.	
Accept.Crit.: The customer is able to move forward/backward in order process without losing data			Conflicts: none	
Cust.Satisf.: Satisfied			Cust.Dissatisf.: Dissatisfied	
ID: 375	UseCase: 2	Verified	Prio: 5	WP7
Customer has to be able to save shopping cart			Functional	
Description: While shopping the customer adds different products to shopping cart which are stored for the session. Registered users should be able to save their shopping cart for another visit. In this case the customer is able to submit an order some days later.			Rationale: To allow customer to keep shopping another day from the point he stopped	
Accept.Crit.: user must be able to save shopping cart within his user profile and to load it afterwards			Conflicts: none	
Cust.Satisf.: Very satisfied			Cust.Dissatisf.: Very dissatisfied	
ID: 377	UseCase: 2	Verified	Prio: 5	WP7
System has to be able to send order confirmation			Functional	
Description: The system has to be able to send an order confirmation, including invoice and links to order notification settings, to the customer. Notification according to user settings (level, type).			Rationale: To provide customer with necessary information.	
Accept.Crit.: user receives a confirmation after submitting an order			Conflicts: none	



Cust.Satisf.: Very satisfied			Cust.Dissatisf.: Very dissatisfied	
ID: 379	UseCase: 2	Verified	Prio: 5	WP7
System has to be able to store order information to database			Functional	
Description: System has to be able to store order information in a database that is accessible via the whole collaboration network. The order information should include customer details (e.g. name, address, e-mail), product details (e.g. shirt model, size, colour), order details (e.g. order date, expected delivery date) and production specifications (e.g. position of embroidery, collar size).			Rationale: To receive order information in order to start production.	
Accept.Crit.: A data set is created in the database after order process is completed			Conflicts: none	
Cust.Satisf.: Very satisfied			Cust.Dissatisf.: Very dissatisfied	

Table 1: Requirements for the selected Use Case #2

2.1.2 Use Case #10 Order of Individual Shirt Design

- Customer (C) accesses web shop
- Customer selects individual design option
- Selects basic shape
- Customer selects sleeve length
- C selects collar type (v-neck, rounded, stand-up)
- C selects design (Design 1-x) or creates design
- Selects colour of Shirt
- Selects colour of design elements
- Provided picture of the shirt model is changing according to selected data
- Customer can change selection
- C can add embroidery (UC11)
- System displays picture of shirt according to all changes made
- System prepares specification sheet for producer (e.g. measurements, color-codes, amount)
- System informs appropriate processors about order (producer, embroidery, DC21)
- System displays expected date of delivery and changed prize of the shirt
- Customer goes on with Use Case “Standard Web shop Order”

Table 2 describes the requirements for the selected Use Case #10:

ID: 420	UseCase: 10	Verified	Prio: 5	WP7
Customer has to be able to change the colour of shirt/piping			Functional	
Description: With the individual shirt design tool the customer has to be able to change the colour of shirt and piping (with a colour picker for instance).			Rationale: To allow individual shirt design (colours)	
Accept.Crit.: A UI control is provided to change the shirt/piping colour (e.g. a colour picker)			Conflicts: none	
Cust.Satisf.: Satisfied			Cust.Dissatisf.: Dissatisfied	
ID: 421	UseCase: 10	Verified	Prio: 5	WP7
Customer has to be guided through shirt design process			Usability	
Description: In the individual design tool the customer has to be guided through the designing process (e.g. instructions, help, support with photos and tooltips, forward/backward-option with a status bar for instance). This process has to be simple.			Rationale: To guide customer through design process	
Accept.Crit.: System provides information about possible customisation			Conflicts: none	

features of each design step and shows the result immediately with an image of the shirt. The design process is separated into different areas (e.g. sleeves, collar, material)		
Cust.Satisf.: Satisfied		Cust.Dissatisf.: Dissatisfied
ID: 418	UseCase: 10	Verified
Customer has to be able to fill in tailor-made measurements in form		Functional
Description: A form for input of tailor-made measurements has to be provided to allow the customer to fill in his personal measurements of collar (length), sleeves (length), chest (width), waist (width), hip (width).		Rationale: To allow input for tailor-made shirts
Accept.Crit.: A dialog to specify personal body-details and functionality to save it to database		Conflicts: none
Cust.Satisf.: Satisfied		Cust.Dissatisf.: Dissatisfied
ID: 424	UseCase: 10	Verified
System has to be able to generate specification sheet for production according to user input		Functional
Description: System has to be able to provide specification sheet for production according to user input (e.g. exact position of embroidery, exact colour codes). Furthermore cuts for producer, 3D-simulation for tutorial etc. should be generated.		Rationale: To prepare exact details for shirt production according to user input
Accept.Crit.: System generates a standardised order form including all relevant information and files in the needed format/quality. System needs to read all detail information from the original user order and need to enrich it by data needed to the production.		Conflicts: none
Cust.Satisf.: Satisfied		Cust.Dissatisf.: Dissatisfied

Table 2: Requirements of the selected Use Case #10

2.1.3 Use Case #11 Order of Embroidered Shirt

- Same activities apply as in use case “Standard Web shop Order” (like selecting shirt, specify address, provide payment details,...)
- Customer selects individual design option and the embroidering option
- Same activities apply as in use case “Order Of Individual Shirt Design”
- Customer uploads file/enters text (information about needed file type or resolution is provided)
- System checks file (specified in use case “Custom Production Preparation”)
- System displays simulation of embroidery on shirt
- Customer positions embroidery on simulated shirt model
- System displays shirt according to all changes made
- System prepares a specification sheet for embroidery (e.g. size of logo, used colours, exact position, amount)
- System informs appropriate processors about order (producer, embroidery, DC21)
- System displays expected date of delivery and changed prize of the shirt for customer
- Customer goes on with use case “Standard web shop Order”
- System prepares specification sheet for producer (e.g. measurements, color-codes, amount)
- System informs appropriate processors about order (producer, embroidery, DC21)
- System displays expected date of delivery and changed prize of the shirt
- Customer goes on with use case “Standard web shop Order”

Table 3 describes the requirements for the selected Use Case #11:

ID: 425	UseCase: 11	Verified	Prio: 5	WP7
System has to be able to match picture file colours with embroidery colour codes			Functional	
Description: The system has to be able to select the correct embroidery colour codes of the uploaded picture file (RGB or CMYK).			Rationale: To ensure quality of embroidery	
Accept.Crit.: System identifies best match of embroidery colour code to colour code within custom shirt design file on the basis of an algorithm or integrates 3rd party tool which offers the service.			Conflicts: none	
Cust.Satisf.: Satisfied			Cust.Dissatisf.: Dissatisfied	
ID: 426	UseCase: 11	Verified	Prio: 4	WP7
Customer has to be able to position the uploaded graphic file on a shirt image			Functional	
Description: As soon as a customer uploads a graphic file for embroidering, the system has to display it on a 360 degree view of the shirt (in individual shirt design tool). The customer then has to be able to position the graphic wherever he likes it to be embroidered on a 360 degree view (some constraints have to be defined by DC21 and embroidery).			Rationale: To position graphic for embroidery	
Accept.Crit.: User is able to pick a standard logo format (e.g. png) and is able to place it on a 360 degree view or just on a front view.			Conflicts: none	
ID: 428	UseCase: 11	Verified	Prio: 4	WP7
System has to be able to generate specification sheet for embroidery according to user input			Functional	
Description: The system has to be able to generate specification sheet for embroidery according to user input (e.g. size of graphic, exact position, colour codes, amount, photo of simulation).			Rationale: To guarantee quality of embroidery and customer satisfaction	
Accept.Crit.: System generates a standardised order form including all relevant information and files in the needed format/quality. System needs to read all detail information from the original user order and need to enrich it by data needed to the embroidery.			Conflicts: none	
Cust.Satisf.: Satisfied			Cust.Dissatisf.: Dissatisfied	

Table 3: Requirements of the selected Use Case #11

2.1.4 Use Case #6 Production of Shirt Parts

- Producer receives new order in the order overview (notification via e-mail or tablet for instance)
- Producer checks out order and Producer dispatches order to production preparation manager (notification via tablet for instance)
- Production preparation manager personally assigns tasks to cutters
- Cutter fixes and press certain parts of the textile with fleece
- Cutter highlights the shirt parts on the textile according to the designs
- Cutter cuts parts out of the textile
- Shirt parts needed for embroidery have priority
- Production preparation manager brings parts to ironing station if needed (other parts are ironed while assembling parts)
- Cutter sorts cut parts into boxes (one box for each shirt model/each size/each colour)
- In case of embroidery some parts have to be shipped to embroidery
 - System shows offline progress steps (cutting done, sewing done etc.)
- Producer checks in order i.e. Production preparation manager announces finished step (manual input in system – e.g. tablet)
- System displays status of order (status shown in Use Case “Order Progress Notification”)

Table 4 describes the requirements for the selected Use Case #6:

ID: 399	UseCase: 6	Verified	Prio: 2	WP7
Production manager has to be able to assign tasks to worker			Functional	
Description: Production manager has to be able to assign tasks to workers according to incoming orders (can look like a to-do-list for each worker for instance).			Rationale: To generate kind of to-do-list for each worker	
Accept.Crit.: System provides an open order list and the possibility to assign registered staff members to them for processing			Conflicts: none	
Cust.Satisf.: Undecided			Cust.Dissatisf.: Undecided	
ID: 401	UseCase: 6	Verified	Prio: 3	WP7
Producer has to be able to announce finished step (order status)			Functional	
Description: Producer has to be able to announce finished step (e.g. pieces cut, shirt sewed, shirt packed) via tablet for instance. Basically a manual order status update.			Rationale: To update order status	
Accept.Crit.: On finishing an production step, the processor can easilly check an order in, the production status then is automatically updated and communicated through the network (e.g. customer notification)			Conflicts: none	
Cust.Satisf.: Satisfied			Cust.Dissatisf.: Dissatisfied	

Table 4: Requirements of the selected Use Case #6

2.1.5 Use Case #21 Reduction of transportation distances

- System receives order
- System suggests closest and available processers (producer, embroidery)
- Production site and embroidery as well as production site and customer should be close to each other to reduce time and costs of delivery (the distance to textile producer is not as important as material is ordered a few times a year)
- DC21 receives suggestion, selects and confirms processor
- Producer receives order and confirms it
- System displays simulation of embroidery on shirt
- Customer positions embroidery on simulated shirt model
- System displays shirt according to all changes made
- System prepares a specification sheet for embroidery (e.g. size of logo, used colours, exact position, amount)
- System informs appropriate processors about order (producer, embroidery, DC21)
- System displays expected date of delivery and changed prize of the shirt for customer
- Customer goes on with Use Case “Standard web shop Order”
- System prepares specification sheet for producer (e.g. measurements, color-codes, amount)
- System informs appropriate processors about order (producer, embroidery, DC21)
- System displays expected date of delivery and changed prize of the shirt
- Customer goes on with Use Case “Standard web shop Order”

Table 5 describes the requirements for the selected Use Case #21:

ID: 396	UseCase: 21	Verified	Prio: 4	WP7
System has to be able to recommend producer who matches customers preferences			Functional	
Description: System has to be able to recommend producer who matches customers preferences (e.g. who is the closest to end customer or who is the cheapest)			Rationale: environmental production, saves money	
Accept.Crit.: System identifies appropriate producer according to customer preferences.			Conflicts:	
Cust.Satisf.: Undecided			Cust.Dissatisf.: Undecided	

Table 5: Requirements of the selected Use Case #21

2.2 Adaptation of the Conceptual Software Design

2.2.1 WP5 Compliance

Adapting the conceptual software design of WP5 is about taking care of the workflow models and the related navigation. As WP5 discusses app orchestration using multiple apps, the communication between these different apps must be granted and a specific navigation design will be provided. Therefore, the component *App Linker* is introduced within the software design as well as the *Navigation Design Creator*. WP5 will support the software design with these components to create the navigation design (*Navigation Design Creator*) and the communication between apps (*App Linker*). The latter derives a navigation design for the supported workflow, which can be provided by Adonis or an UML diagram. The *App Linker* places in-app links and populates context menus. All information the linker needs for these purposes will be provided by the model from the *Navigation Design Creator* component.

2.2.2 Use Case Specific Adaptation of the User Interface

We now change our focus away from the requirements towards the design of visual mockups on the basis of the requirements identified in the previous section. Most workflow and business process modelling languages share basic concepts that are necessary for process modelling. This common conceptual basis shall serve as starting point for deriving workflow patterns for mobile collaboration. For details please refer to CV-D5.2.1. In this section we will present selected workflow models for the Customer-oriented Production application area along the example of scenarios known from the previous section:

- Standard Web Shop Order and Custom Order/Tailor made Scenario (CV-D7.1.1, page 30)
 - Use Case #2 Standard Web shop Order
 - Use Case #10 Order of Individual Shirt Design
 - Use Case #11 Order of Embroidered Shirt
- Flexible Production Environment Scenario (CV-D7.1.1, page 34).
 - Use Case #6 Production of Shirt Parts
 - Use Case #21 Reduction of transportation distances

All above scenarios have been described in UML Diagrams (for the UML specification, please see OMG, 2011) as such diagrams serve us well dealing with requirements. Yet, in compliance with 4.3.6 *The Process Model Type* (see CV-D3.1.1), which could be represented by an Adonis models, but also be available as UML diagrams, (Fischer, 2011) are to serve as the starting point for the design of what WP5 describes as *Orchestrated Apps* using *Generic Apps* selected from a pool of such apps.



Generic Apps are used to handle an activity (single task purpose) or an aggregation of activities. That means that the related workflow is divided in single reusable tasks. These reusable tasks are the basic structure for generic apps. This assignment of generic apps to an activity or aggregation of activities is suggested in CV-D3.1.1. This approach is used in WP5 using a *Model-App-Comparator* to reconcile Generic Apps with the task model. Furthermore, all available apps own a description to support the selection of the most appropriate Generic App out of the pool of Generic Apps. However, this information must be provided to the model that initiates the process of building the navigation design.

As stated before, each app should own a dedicated task – to fulfil the requirement of the UI guidelines, to build single task apps – which is related to one task of the navigation model (UML diagram or Adonis model). Currently there is no prototype implementation yet, neither the WP5's *Model-App-Comparator* nor the information of the above-mentioned model.

2.2.2.1 Use Case #2 Standard Web Shop Order

The use case #2 describes a standard web shop order. i.e. the customer selects the desired collection. Here he/she can select different colours, different styles, sizes amounts etc. and also an optional embroidery. An automatic recommendation tool recommends accessories or other products fitting to the selected shirt. Basically DC21 suggests the price and the way the shirt is produced. However, the DC21 customer can also decide by him/herself which production options he/she wants to choose (e.g. cheap production, close distance of producer, preferred delivery date). Finally the product is put in the cart. By checking out, a pop up appears with the possibility to log in via e-mail or Facebook account. Finally the delivery type as well as the notification level (e.g. SMS when the next production step has been reached) as well as the payment method can be selected.

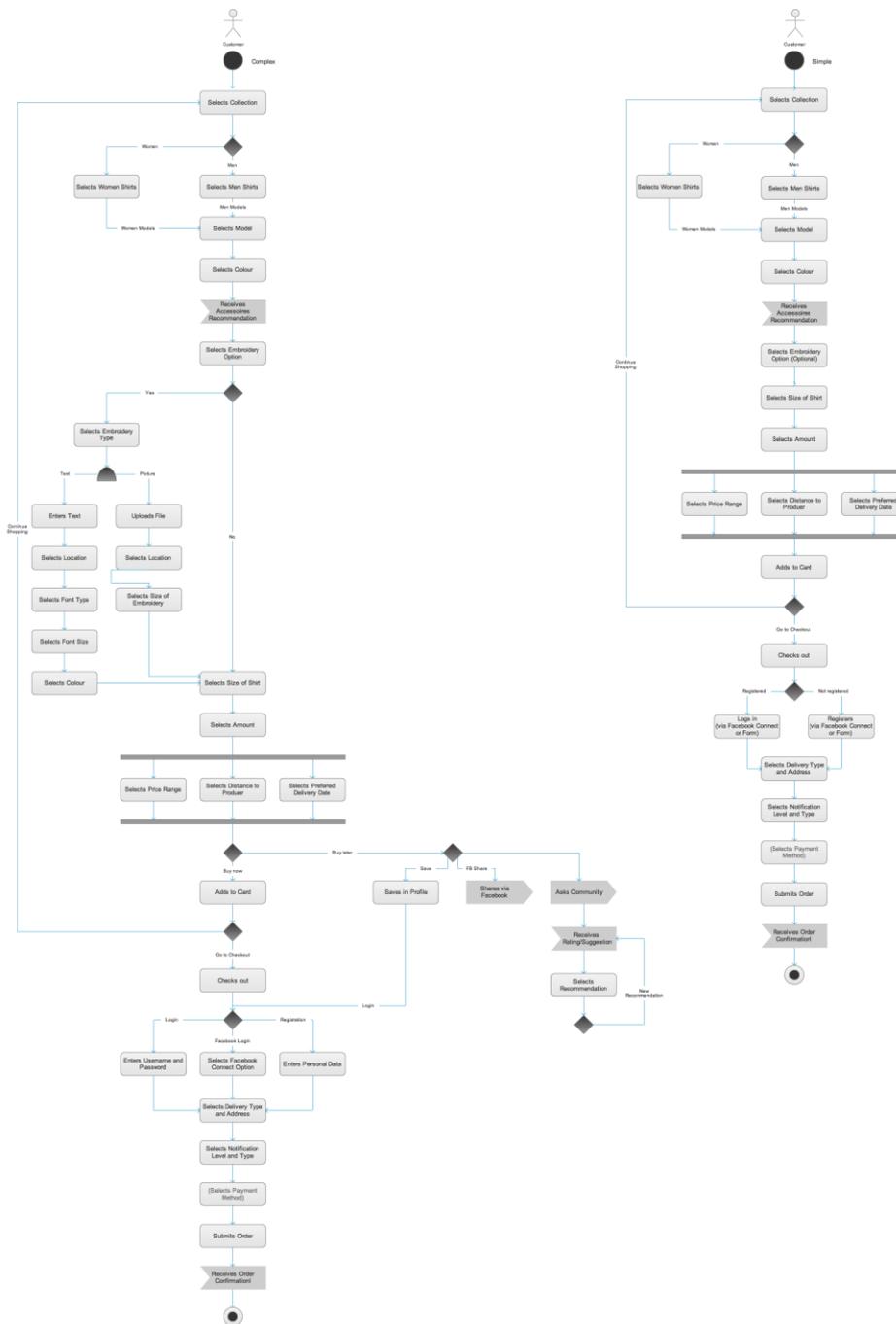


Figure 1: Use Case #2

2.2.2.2 Use Case #10 Order of Individual Shirt Design

The Use Case #10 describes the order of an individual designed shirt. The customer can select the different sleeve lengths, colours etc. Additionally, he/she can choose between an existing design or upload a design created by him/herself. Similar to the Use Case #2 the embroidery can be added and the ordering process continues as in Use Case #2

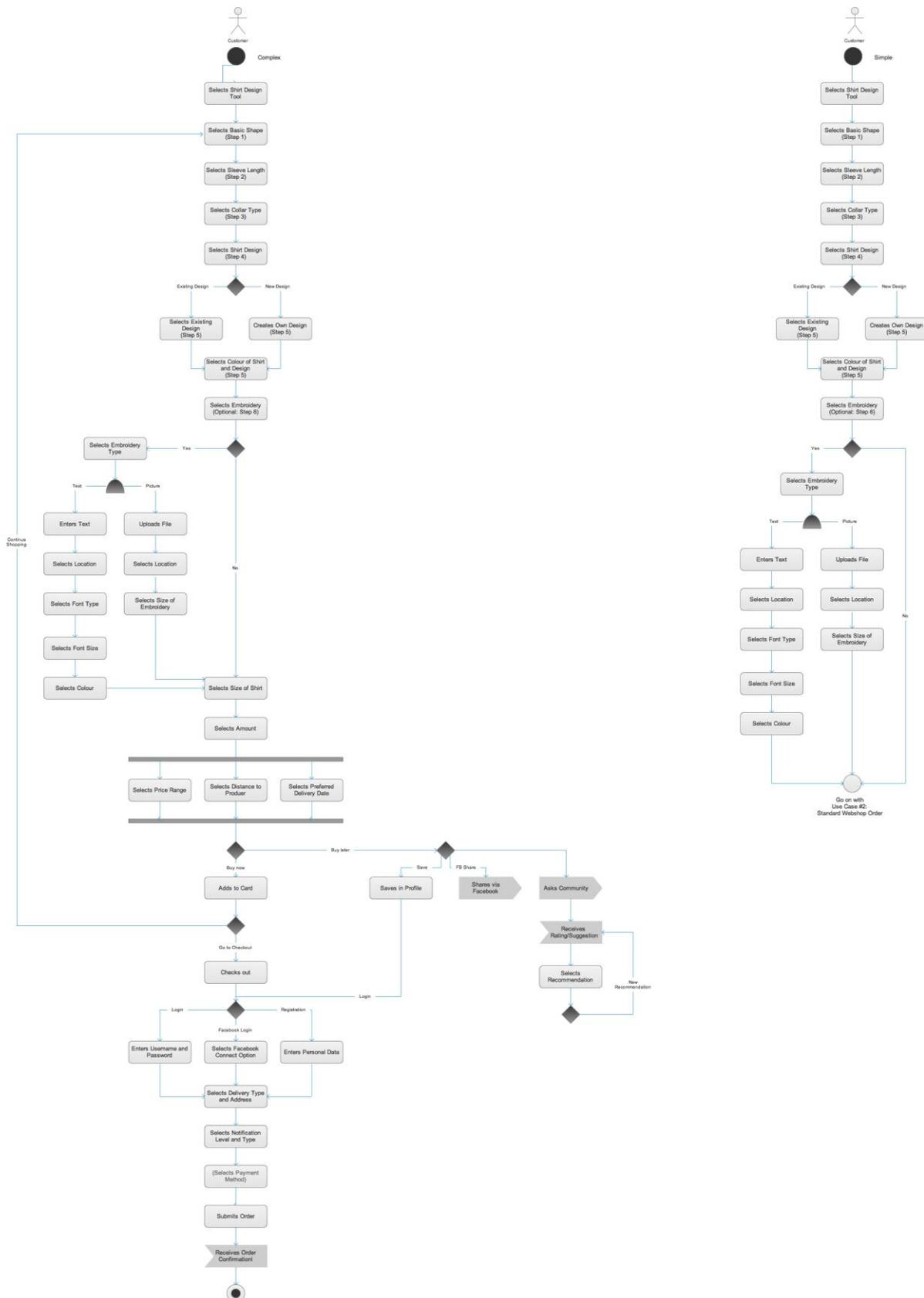


Figure 2: Use Case #10

2.2.2.3 Use Case #11 Order of Embroidered Shirt

Similar to the Use Case #2 the embroidery can be added and the ordering process continues as in Use Case #2.

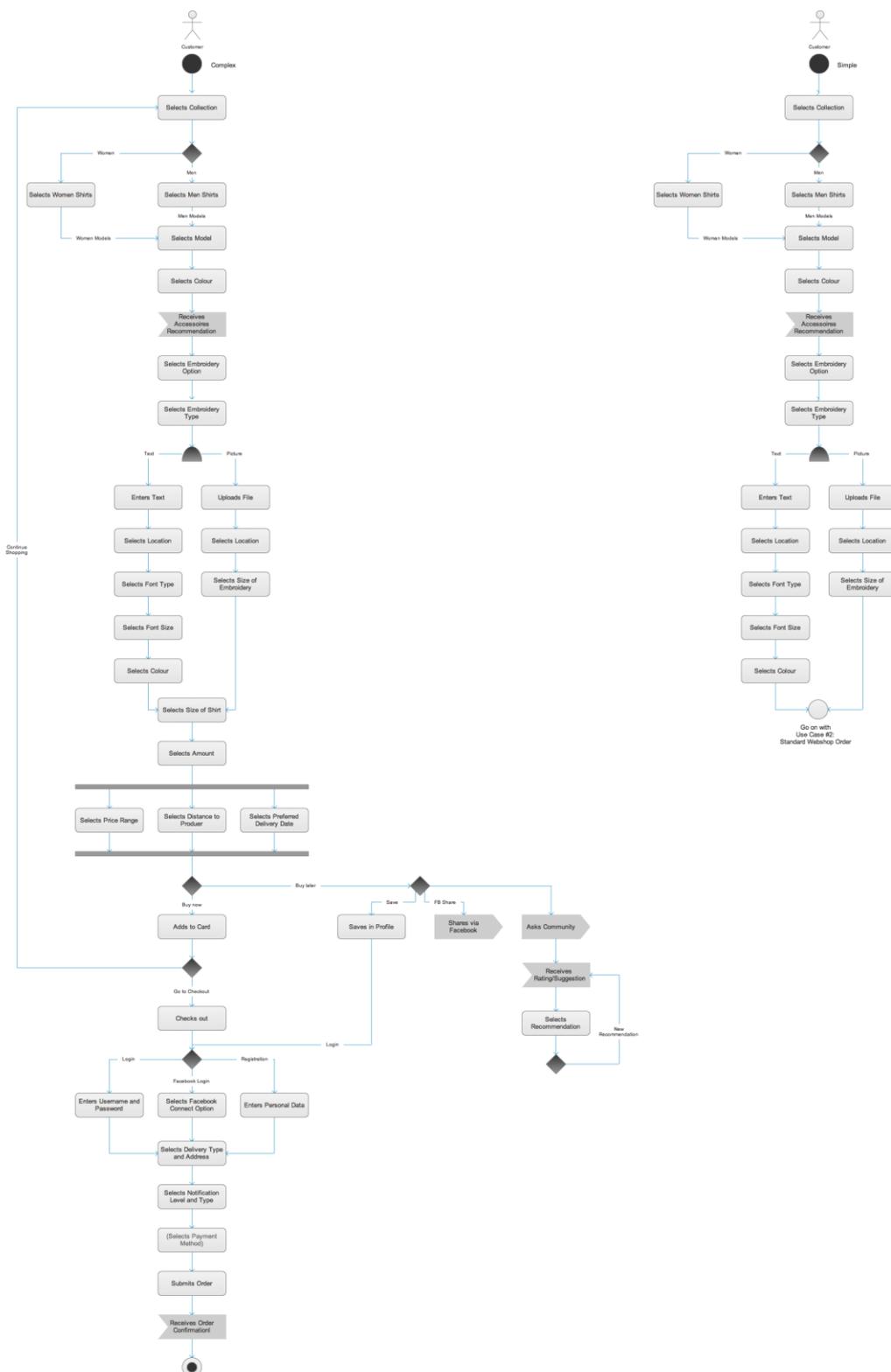


Figure 3: Use Case #11

2.2.2.4 Use Case #6 Production of Shirt Parts

The Use Case #6 describes the producers view. I.e. once a customer submits an order the recommended or selected shirt the producer receives all the required details for the production. By checking out the shirt, all involved partners including the customers are automatically informed that the first step of the production has started. Once the shirt parts are cut and the embroidery is done, the producer checks the shirt in again. Now all involved partners know, that the second production step has started.

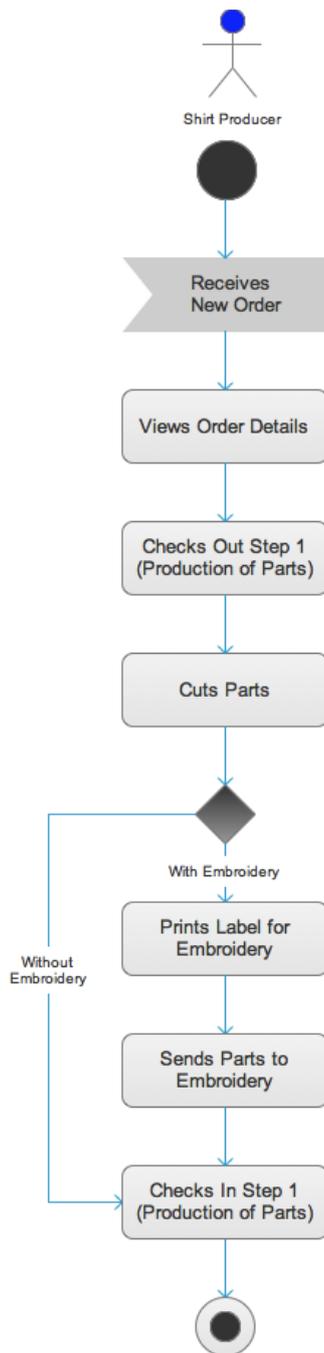


Figure 4: Use Case # 6

2.2.2.5 Use Case #21 Reduction of Transportation Distances

The Use Case #21 allows the customer to optionally select the price of his/her shirt, the distance of the producer or the time of delivery. If this feature is not requested by the customer the DC21 web shop selects the best fitting producer automatically – based on the shipping address and the amount of shirts. The idea behind this use case is to provide a transparent price and production management. If customers wish an environmentally friendly production e.g. by minimising the transportation distance they can choose the closest producer. Other customers might prefer the cheapest production and can select the producer over the price.

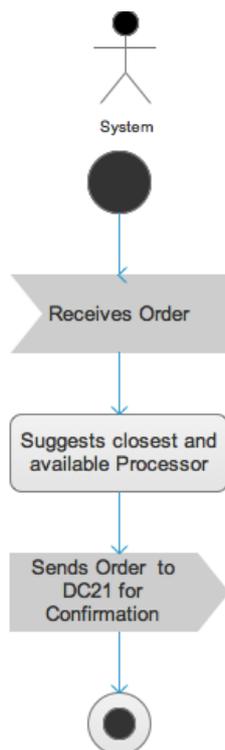


Figure 5: Use Case #21

2.3 Recommendations for the Implementation of the Adapted Software Design

On the basis of the above shown UML diagrams we developed mockup screens that will serve as a guideline for the Android prototype developed in WP 11.

For the first implementation of the prototype in task CV-T11.2 we have chosen the AXURE wireframing, prototyping and specification tool (www.axure.com). This tool allows creating a good mockup without having to implement everything. Thus, design and interface adaptation can be done quickly and the Android app development is supported through very detailed templates of the user interface.

In the following we will present selected mockup screens reflecting the described scenarios and use cases. These screens represent a first suggestion and recommendation for the first prototype in M14.

Currently, the mockup design can be understood as a guideline for realising the first prototype. The functional user interface elements are suggested in the mockup, however, the developer will choose the final design of buttons and menus from the Android templates.

The validation and evaluation of the adapted UI pattern and workflow model will provide further recommendations for the upcoming prototypes.

2.3.1 Customer View

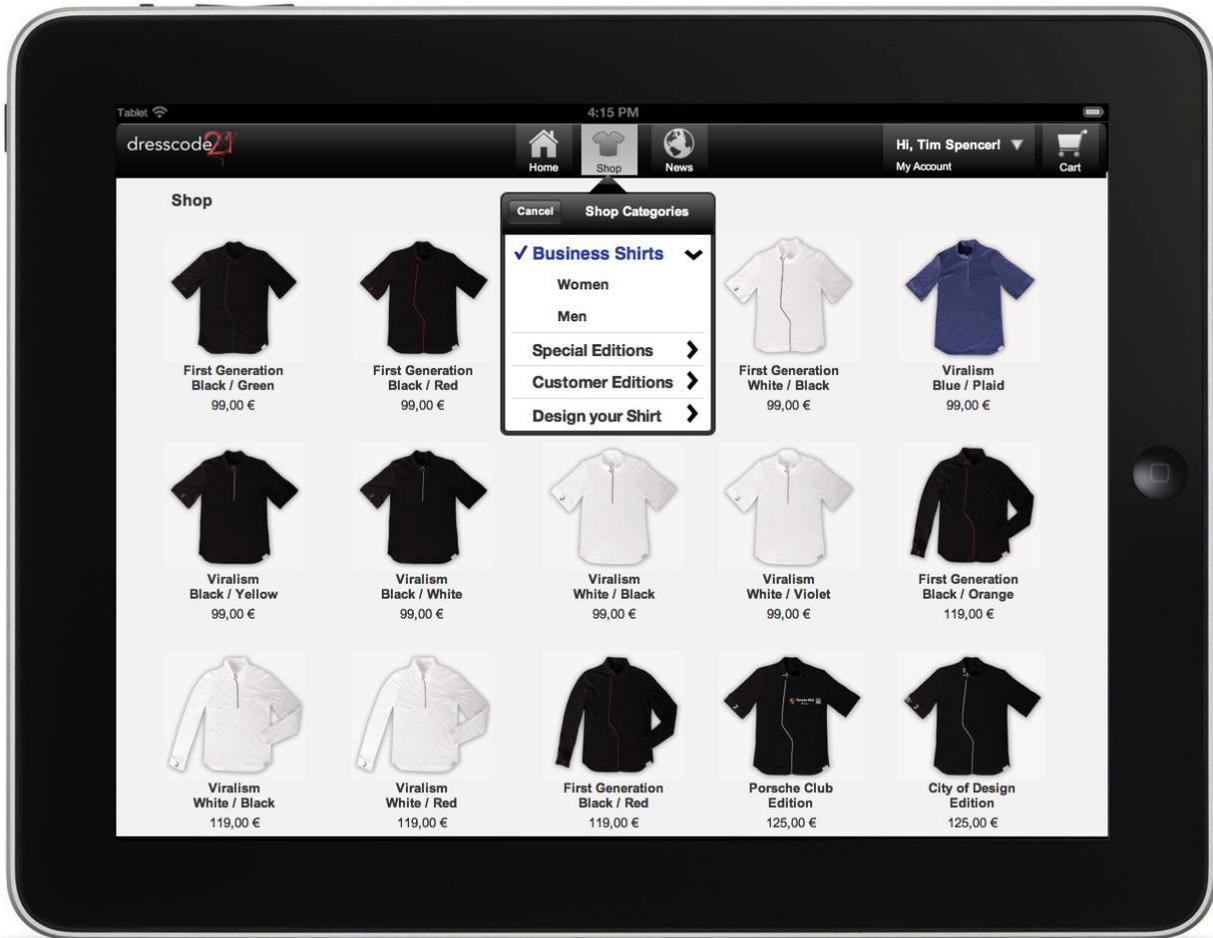


Figure 6: Mockup screen shop overview

Use Case #2

This mockup screen represents the shop overview, showing the overview pattern and a drop down menu side.

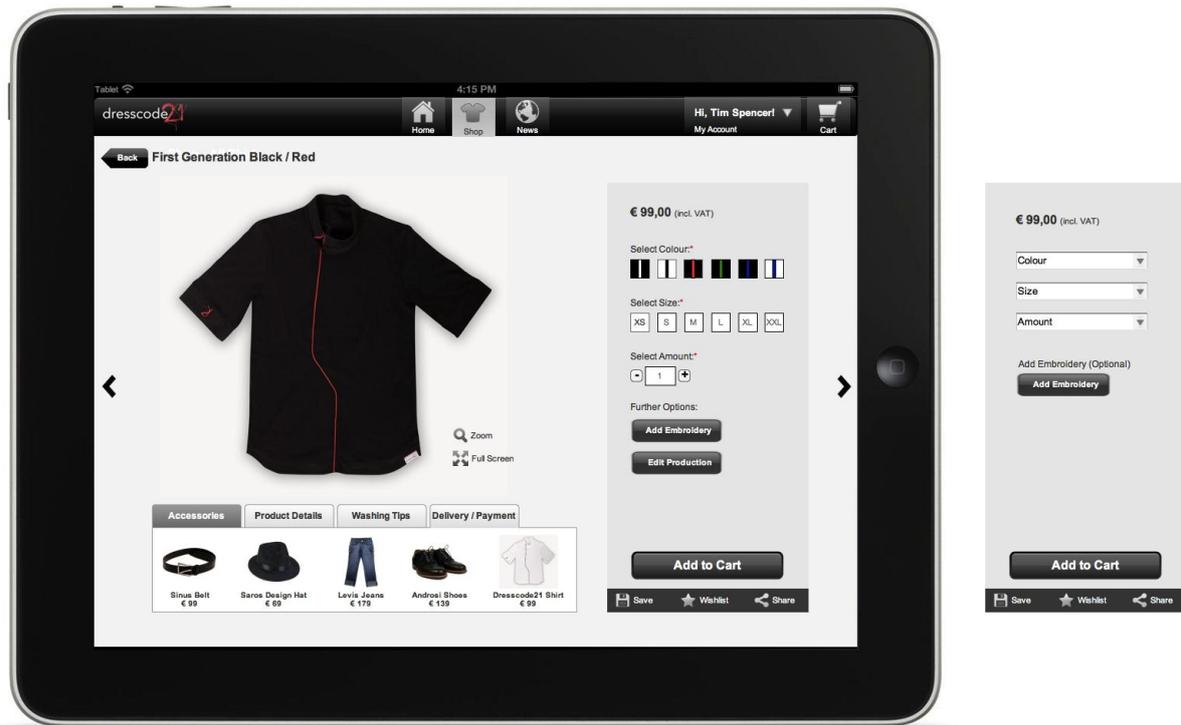


Figure 7: Mockup screen shirt selection I

Use Case #2

This mockup screen represents the shirt selection, using the Master/Detail Pattern (right table is master, left panel is detail view; at the bottom automatic recommended accessories are shown) and the Selection Pattern (buttons on the right).

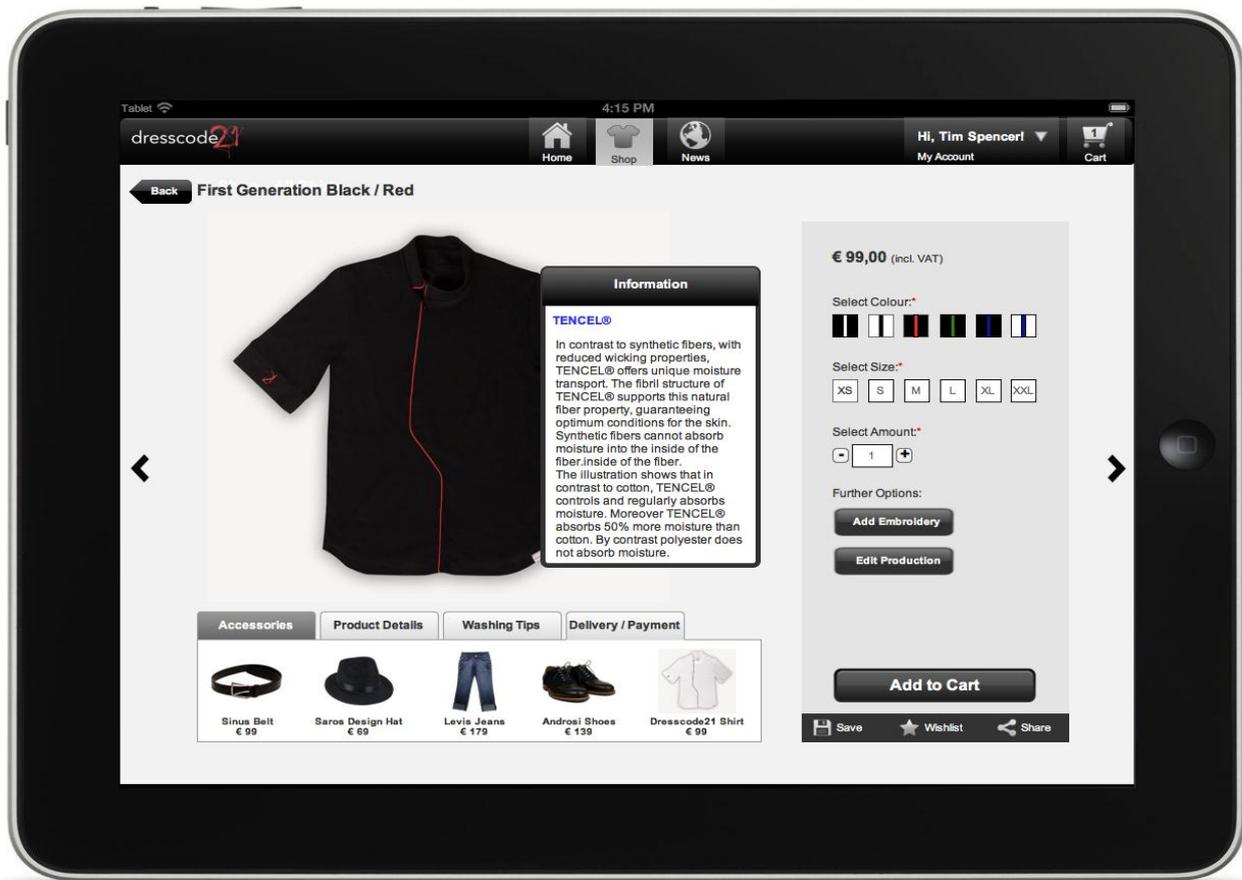


Figure 8: Mockup screen shirt selection II

Use Case #2

Mockup screen of the shirt selection, using the information pattern. Detailed product information is shown by a mouse over pop up. Navigation pattern, arrows at the right and left side of the screen indicate the navigation patterns,

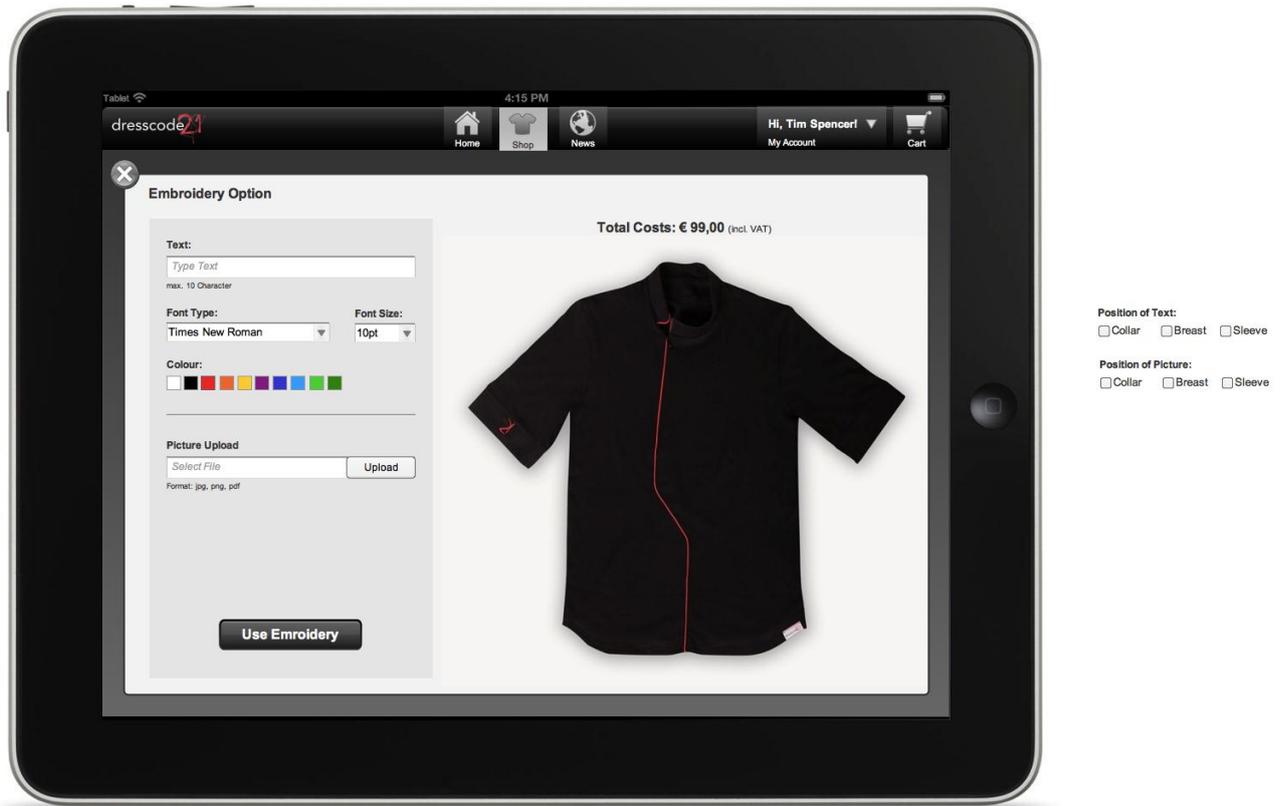


Figure 9: Mockup screen embroidery option I

Use Case #2

Mockup screen of the embroidery option, using the Master/Detail Pattern (left table is master, right panel is detail view),

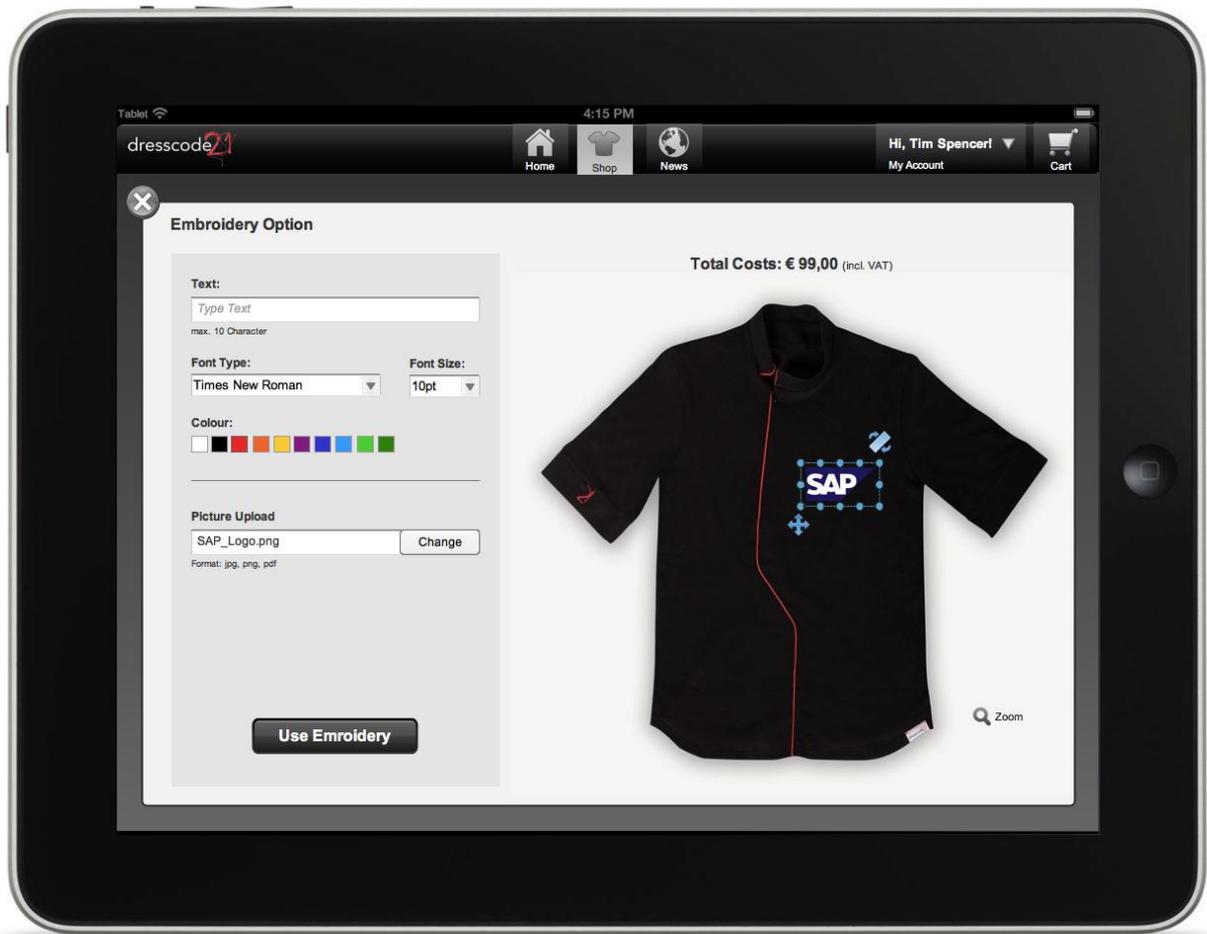


Figure 10: Mockup screen embroidery option II

Use Case #11

Mockup screen embroidery option II using the individual customer design pattern and embroidery preview.



Figure 11: Mockup screen reduction of transportation cost

Use Case #21 Reduction of Transportation Cost

Mockup screen using the Master/Detail Pattern (left table is master, right panel is detail view).

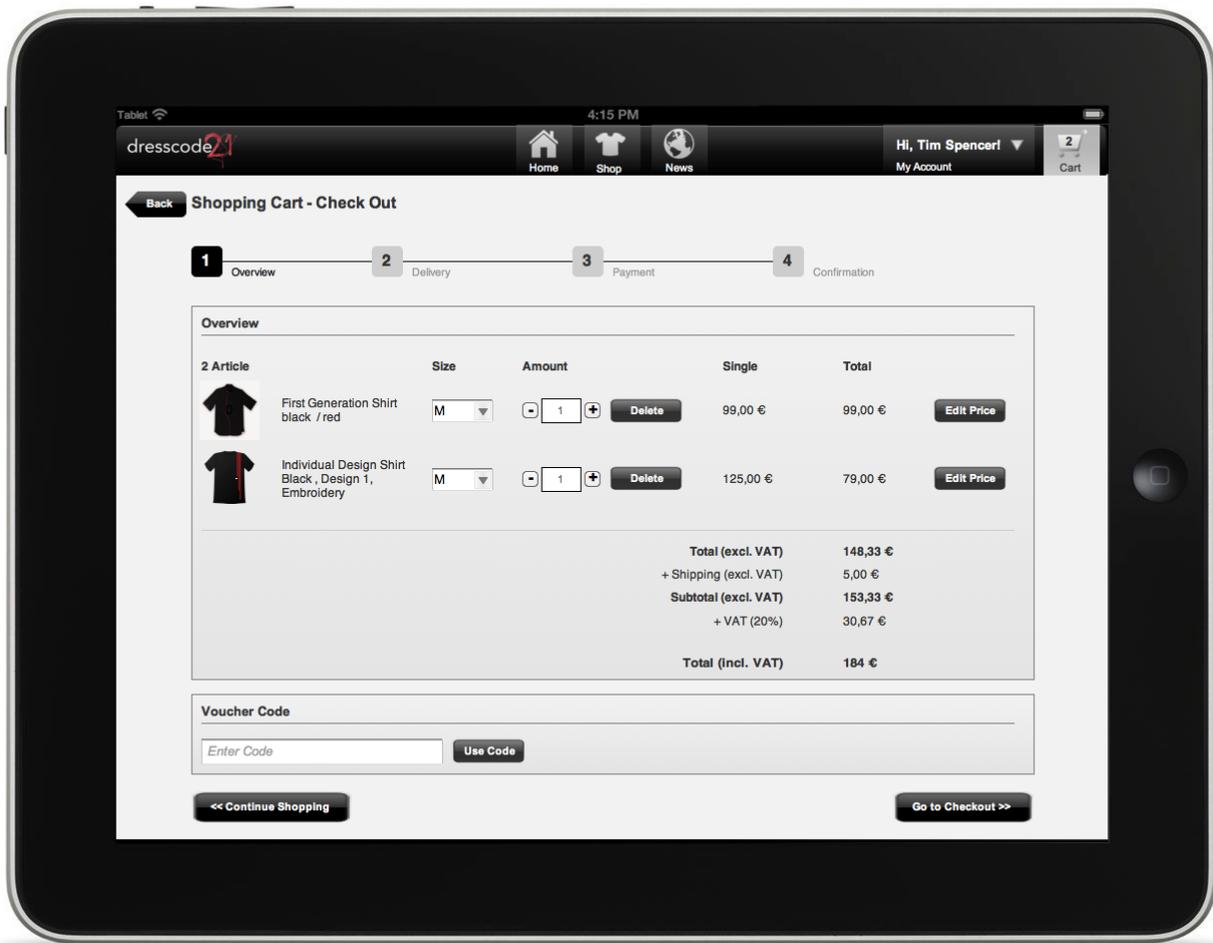


Figure 12: Mockup screen shopping cart overview

Use Case #2

Mockup screen, process pattern for ordering process, list pattern for shopping cart overview,



2.3.2 Producer View

Currently the main focus of DC21 regarding the mockup creation is on the customer side. Therefore the mockup for the producer view currently is not very extensive. However, the mockup for the producer view has the highest potential for app orchestration. Work on deriving a couple of important adaptations as well as possible Generic Apps will start soon and will be included in the next adaptation deliverable.

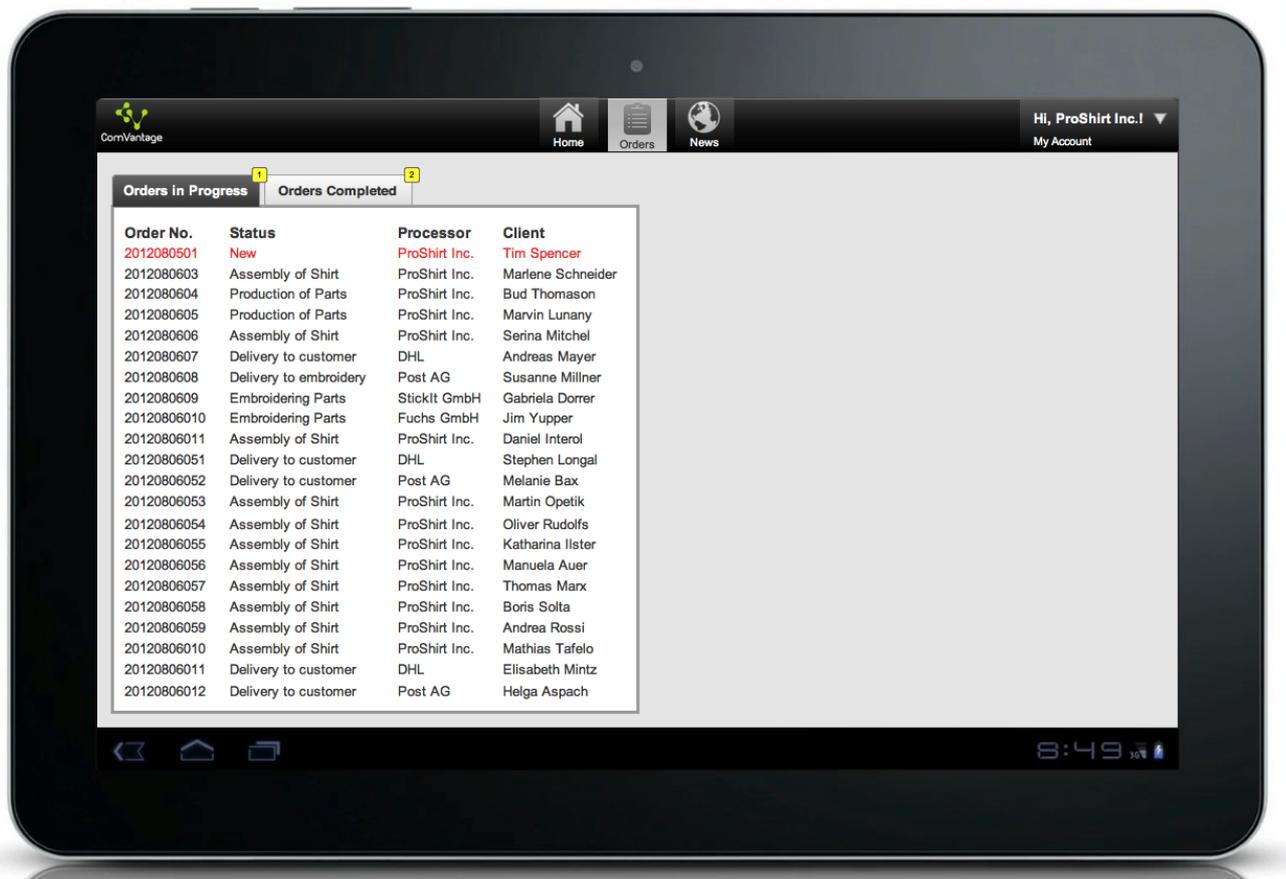


Figure 13: Mockup screen order overview

Use Case #6

Mockup screen of the order overview showing the List Pattern for the producers' view. Tabs allow switching between open and completed orders,

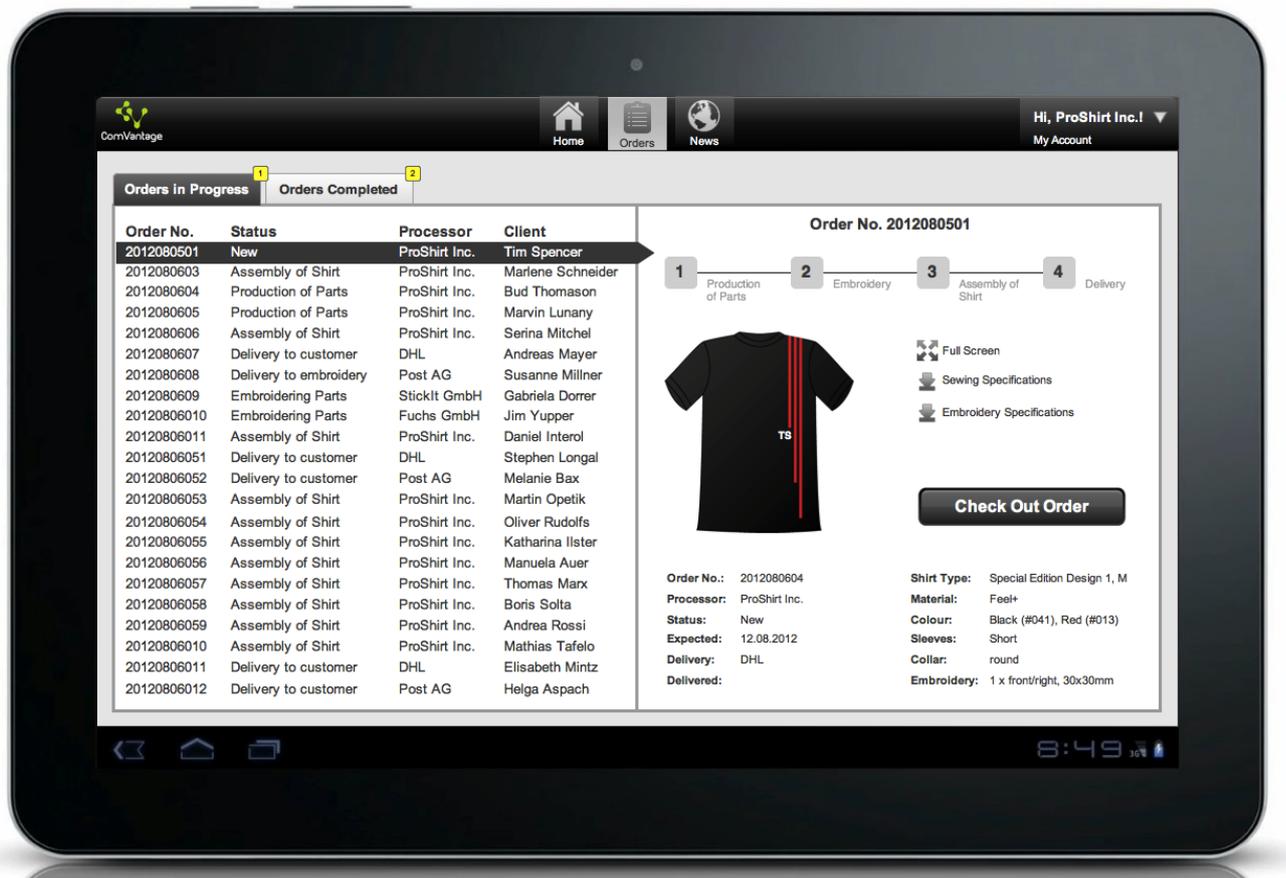


Figure 14: Mockup screen production steps

Use Case #6

Mockup screen for the individual production steps: Mockup screen using the Master/Detail Pattern for producers' view, process pattern (right side) for producer's point of view.

2.4 Application Area Specific Adaptation of the Software Architecture

Regarding the software requirements specification (section 2.1), the adaptation of the conceptual software design (section 0), and the recommendations of the implementation (section 2.3) the following adaptations to workflow and UI are identified in respect to the IAF software architecture.

For the purpose of this deliverable the adaptation recommendations refer to the architecture implementation on the Android platform. In most cases the same recommendations are applicable to the iOS platform which will be implemented in a later phase of the project.

Identified adaptations:

1. Supporting notifications is important and should be adapted by the architecture. This is realised by a notification message, which is a global instance of the underlying operating system. The App Linker should take care of this information (enable, disable notification). From the UI point of view there are two options realising this message. First is the use of the system, which is a small and global solution, second is a custom message that uses some more space but may provide more information. However, as mentioned above, the notification must be supported by the IAF and the App Linker should take care of handling these messages. This messaging system should be able to handle real time information, which means to receive real time information and provide related messages to the user.
2. In general, there is a given path through the workflow. At certain points this path should offer alternative routes to the same target. The *Navigation Design Creator* should enable these alternative routes. This adaptation is related to the *App Linker* and the *Navigation Design Creator*.
3. Navigation within a workflow or through information spaces is not one-way. *The Navigation Design Creator* and the related components should support forward, backward and (as stated in item 2) alternative navigation. The history should be hidden but always available to the user. A global one containing the use of apps and a local one with the in-app navigation.
4. Most of the data are ordered in hierarchies. The IAF should be in the condition to identify these data structures (even if they are not hierarchical data). Supporting the visualisation of the data structure is not necessary by the IAF. The generic app itself decides which visualisation out of the pool of visualisation patterns is best to display the data structure. Therefore, the IAF must enable interfaces to access the data and support the renderer with the information at which point of the workflow this data should be displayed in which context. (This is not related to run-time, but more to design-time and the orchestration process.)
5. All apps need to support the ability to go back to the starting point of the workflow. This is different to the history support. Going back will also remove all changes that were done and entries that have been made. The IAF needs a general call function to trigger all used apps to reset the current state to initial state.

2.5 Application Area Specific Adaptation of the Business Evaluation Framework

In order to assess the business value of *ComVantage*, an evaluation framework has been proposed in deliverable *CV-D9.2.1*. The framework is focused on the links between IT assets, collaborative capabilities and organisational performance.

The organisational performance construct serves as a basis for defining a multi-dimensional metric set. It is composed of two orthogonal dimensions: the operational effects dimension which includes six performance aspects (cost, efficiency, quality, flexibility, innovation and sustainability) and the business process dimension which describes the locus of impact in terms of generic supply chain processes (supplier,

inbound logistics, operation, outbound logistics, marketing and sales). This process-oriented perspective facilitates insights regarding value creation.

A multi-dimensional generic metric set was composed based on an extensive literature review. The metrics were categorised according to both operational effects and business processes dimensions. This generic list was adapted to the related business processes of the Customer-oriented Production application area, based on a high level analysis of its scenarios (detailed in CV-D7.1.1). The main business processes in the Customer-oriented Production application area include various types of customer orders and shirt designs.

The adapted metric set was validated using questionnaires and interviews of key stakeholders in the Customer-oriented Production application partner, DC21 and ISN. In the questionnaire they were asked to assess, on a seven-point Likert scale, the extent to which each metric would reflect the expected change in business performance as a result of implementing *ComVantage*. In the interview, the interviewees were asked several general questions and their responses in the questionnaire were discussed. They were also asked to suggest further metrics, specific to the industry and the organisation in focus (for details see CV-D9.2.2). The interviews revealed that the *ComVantage* platform is expected by the stakeholders to improve innovation by supporting unique and novel designs and order handling. The stakeholders also indicated expectations for better interaction with suppliers based on the new collaborative capabilities which are expected to contribute to flexible and improved performance. Consequently, the most relevant operational effects indicated as reflective of the change introduced by the new platform are efficiency, innovation, and flexibility (Figure 15).

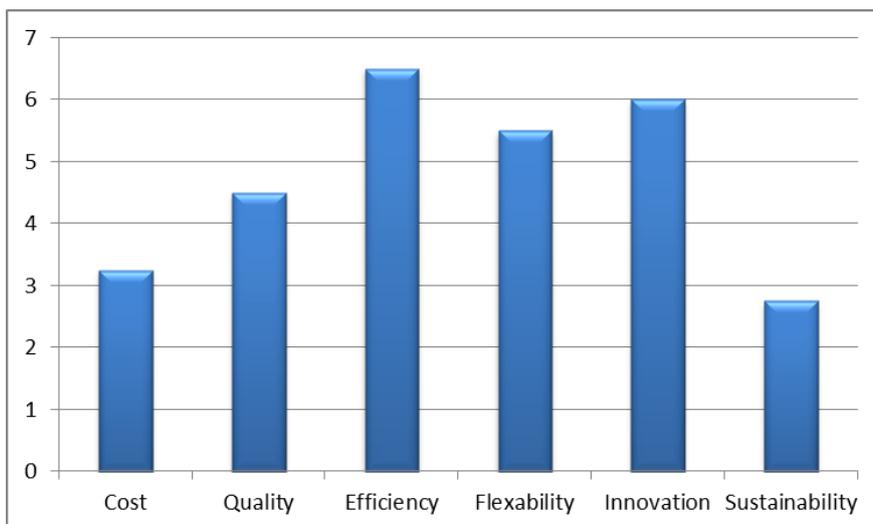


Figure 15: Expected Impact on Operational Effects

The interviewees indicated that improvement is expected in all processes of the supply chain with stronger effects in upstream (supplier related) and downstream (customers related) processes of the supply chain (Figure 16).

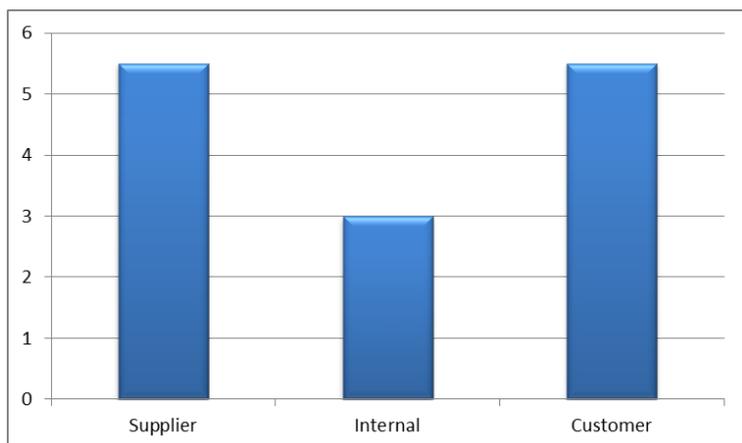


Figure 16: Expected Direct Impact on Supply Chain Processes

Figure 17 summarizes the adaptation process and presents the expected reflection level of the adapted metric set in the Customer-oriented Production application area. Darker cells denote the existence of highly reflective metrics in the category, while lighter cells denote lower reflective metrics. White cells indicate no relevant metrics were found. The results suggest that efficiency, quality, flexibility, and innovation include highly reflective metrics. This confirms the proper measurement of the major value adding areas of *ComVantage* in this application area, including efficiency, flexibility, and innovation. With respect to the business processes dimension, the highly reflective metrics refer to most processes along the supply chain.

No additional reflective metrics were suggested by the interviewees. This may indicate that the metrics found in the literature are sufficient for measuring the expected added value of the *ComVantage* platform in the Customer-oriented Production application area. The complete list of the adapted metric set can be found in *CV-D9.2.2*, section 5.2.

Dimension	Supplier	Inbound	Operation	Outbound	Marketing and Sales
Cost	1	2	2	1	
Efficiency	2		2	2	2
Quality	2	2	1	2	2
Flexibility	2		2	2	
Innovation			2		2
Sustainability			2		2

Legend: 1 Low reflection level 2 Medium reflection level High reflection level

Figure 17: Reflection Level of Metrics

2.6 Validation of the Adapted UI Pattern and Workflow Model

The first Android mockup due in M14 will show a first mockup implementation of the Customer-oriented Production concept. This current concept has been created and roughly evaluated by a user interface expert, however a detailed validation will follow. Based on the experiences derived from this first prototype, the UI patterns and workflow models can be validated from the implementation point of view (e.g. ease of implementation of certain control elements). For the validation of the next version of this deliverable (CV-D7.4.2) in month M24 and M33, we will use the references of IEEE 1012-2012 for validation purposes.

Further, the first prototype as well as the prototypes delivered in month M24 and M33 will be validated against the requirements derived from the scenario and workflow descriptions of the application area *Customer-oriented Production* by determining the degree of the requirement compliance. As a result of the implementation of the prototypes the Customer-oriented Production concept will be further validated with respect to applicability and completeness in supporting the implementation of the Customer-oriented Production prototypes.

2.7 Evaluation Concept on UI Pattern and Workflow Model

CV-D5.1.1 has developed a set of metrics for usability and trust that will be applied when evaluating the adapted software design within the *ComVantage* UCD Lifecycle (see Figure 18). We will strive to evaluate the prototypes with a preliminary version of the collection of questionnaires, protocols and measures that will make up the *ComVantage* usability & trust metrics toolkit as early as possible.

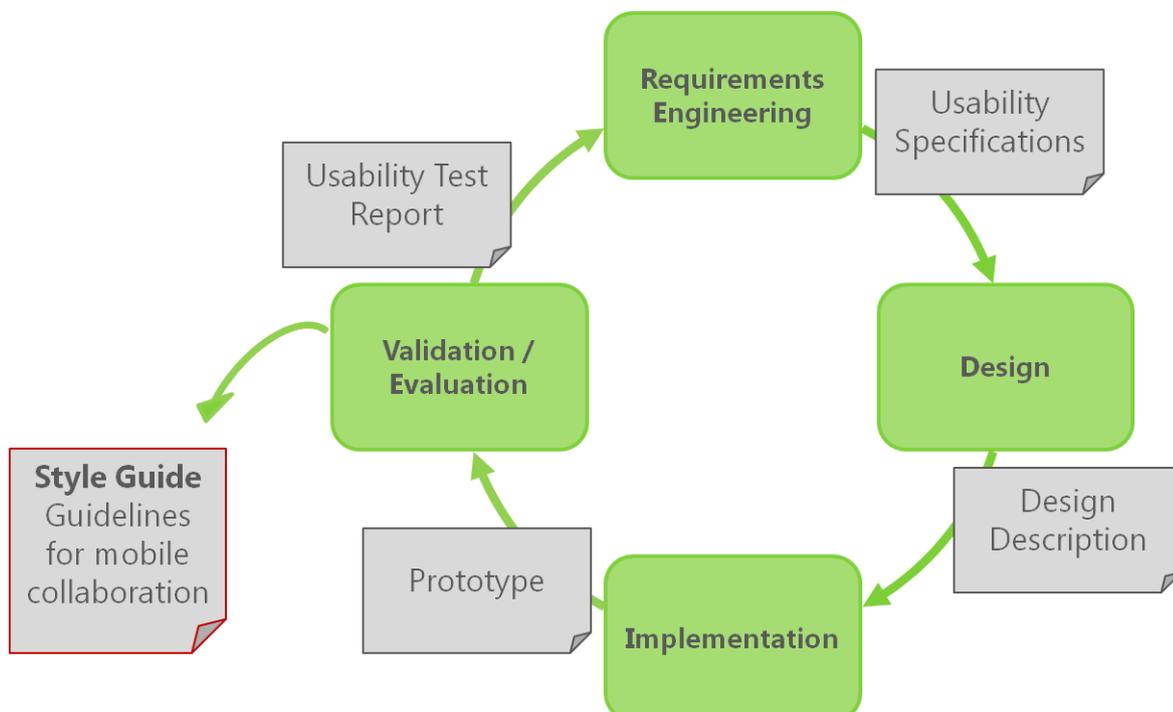


Figure 18: The *ComVantage* UCD Lifecycle (CV-D5.1.1)

2.7.1 Scope of the Planned Evaluations of the Adapted Software Design

The first iteration of the evaluations will be of a formative nature (see Table 6). We have selected heuristic evaluations and cognitive walkthroughs to evaluate the adapted software design. Heuristic evaluations are used in order to ensure the compliance of the prototypes to approved usability heuristics and principles. Cognitive walkthroughs by usability experts detect and eliminate remaining usability flaws.

Evaluation type	Definition
Formative evaluation	Main purpose of the evaluation is to contribute to the optimisation of an object being evaluated.
Summative evaluation	Main purpose of the evaluation is to make a (final) judgment on an object being evaluated.

Table 6: Different types of evaluation with respect to the evaluation target (CV-D5.1.1)

2.7.2 Setting

The first evaluations will take place in laboratory environments such as the Future Factory Living Lab at SAP Research Dresden, or the Usability for Process Industries Lab at TU Dresden. The first iteration of the evaluations will be formative and of an explorative nature and thus may also contain expert-based methods carried out as interactive web conference.

2.7.3 Experiment Design

The complete proposed experiment design can be found in the upcoming CV-D5.1.2.

The general process of preparing the experiment, however, will be conducted as follows:

- Define objectives and criteria of the evaluation
 - Scope of the evaluation relevant usability goals
- Analysis of the context of use
 - Target user, environment, tasks and equipment
- Alignment with the state of development of the prototype
 - Suitability for the tasks w.r.t. level of refinement
- Specification of the experiment design
 - Selection of the evaluation methodology, the evaluators and the location of the execution

3 CONCLUSION AND OUTLOOK

The aim of this document was to give an overview of the activities performed to enable the adaptation of the WP5 work (mainly Task 7.4.1. until M14).

This document described the adaptation of the generic concepts of the Customer-oriented Production scenarios along selected use cases and the requirements derived from these. The adaptation of the conceptual software design is based on early UML diagrams in order to better visualise the required functionalities. Finally, and again following the selected use cases from this document, we summed up recommendations for the implementation of the adapted software design. These recommendations consist of mockup screens that build the basis for the first mockup prototype due in M14.

The presented validation and evaluation concept will evaluate the adaptation of the mobile collaboration concept to the Customer-oriented Production application area.

With respect to the adaption of the concepts of Linked Data, secure information model and mobile collaboration, an important and well selected group of main use cases for Customer-oriented Production will be implemented in a mockup and architectural prototype for mobile maintenance.

The mockup finished in M14 will be the basis for WP5 to make validations concerning the technology of Trustful Mobile Collaboration using orchestration features for Generic Apps. These early prototypes will be enhanced mainly functionally to a further enhanced prototype which will be delivered in M24. For this enhanced prototype, more features of the generic work packages WP3, WP4 and WP5 as well as improvements and changes of WP2 will be implemented.

The final prototype (M33) will integrate the generic concepts as well as the specific extensions of the secure information model, Linked Data integration and user-centric mobile collaboration in the area Customer-oriented Production.



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