



C3-Cloud

**“A Federated Collaborative Care Cure Cloud Architecture for
Addressing the Needs of Multi-morbidity
and Managing Poly-pharmacy”**

**PRIORITY Objective H2020-PHC-25-2015 - Advanced ICT systems and services for
integrated care**

D9.3 Test and Evaluation Report for C3-Cloud Components

Work Package: WP9 Evaluation and Impact Assessment Platform

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EXECUTIVE SUMMARY

WP9 is responsible for the evaluation and impact assessment of the complex clinical, technical and organizational nature of the C3-Cloud components and pilot applications. Task 9.2 concerns the Component Testing and Usability Studies defined below.

The purpose of Deliverable D9.3 is to report the results of the testing of the C3-Cloud components. This testing is based on the evaluation study presented in D9.2. An updated description of this study is presented in this document. Based on the testing criteria defined in deliverable D9.1, the requirements to be tested are identified in the Requirements Traceability Matrix (RTM) delivered in D3.2 and D3.3 as well as in the user scenario descriptions and Pilot Application Requirements (PARs) defined in deliverable D8.1. Within the scope of Task 3.4, the PARs of D8.1 and the RTM of D3.2 and D3.3 have been reviewed and updated by May 2018.

The Component Testing and Usability Studies have been conducted as follow:

Component testing

The C3-Cloud components are the C3DP, PEP, CDSM, TIS, SIS and SPS. The functional and non-functional test cases for the C3-Cloud software components have been defined based on D3.2 Requirements Specification of the C3-Cloud Architecture and D3.3 Conceptual Design of the C3-Cloud Architecture, and by complying with the IEEE 829 Standard for Software and System Test Documentation.

Functional testing is concerned only with the functional requirements of a system or subsystem and covers how well (if at all) the system executes its functions.

Non-functional testing is concerned with the non-functional requirements and is designed specifically to evaluate the readiness of a system according to the various criteria, which are not covered by functional testing.

Each C3-Cloud component's testing is reported into a "Test Plan" and "Test results report". With respect to the scope and current state of the project, this is done, by checking and merging the headings of IEEE 829 standard's templates for Component Testing.

Usability studies

Application testing: Application testing is linked to usability studies and it considers how people interact with the software. It includes the evaluation of the integration of C3-Cloud components and functional testing of the application as a whole and evaluates if all C3-Cloud components work well together.

A “Refined-Delphi” approach has been adopted for the assessment criteria for the C3-Cloud integrated application. The Pilot Application Requirements (PAR) have been used to define which requirements are to be tested through application and usability testing in task 9.2. Further information can be found in chapter 3 of deliverable D9.1. Professionals, patients and informal caregivers from all 3 pilot sites of the C3-Cloud project performed application testing.

Usability and usefulness: Questionnaires to assess usefulness and ease of use for the end users have been answered by C3-Cloud test users using both “the product reaction cards” method and the QUIS7 questionnaire (Questionnaire on User Interaction Satisfaction, version 7) (see Appendix 10.5)

Mock-up reporting

This section compiles all the feedback of the mock-ups from the actual users of the ICT C3-Cloud components/solutions in the three pilot sites. This activity is part of the Evaluation layer 1, which aims to evaluate the User-centered Design (UCD) from the very beginning of the project. Evaluation layer 1 uses UCD testing with software mock-ups (to get feedback from end-users which is implemented incrementally), a component testing protocol and an application testing protocol as evaluation means.

Heuristic Evaluation

The protocol for the heuristic usability testing is developed by WARWICK. It involved five health ICT experts from the University of Warwick and is carried out in the scope of T9.2, based on a storyboard guiding through the usage of the Patient Empowerment Platform (PEP) and the Care and Cure Delivery Platform (C3DP).

Task 9.2 started in month 17 (1 September 2017) and will end in month 26 (30 June 2018).

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1 DOCUMENT OVERVIEW

1.1 Introduction

The C3-Cloud project aims at building an ICT infrastructure enabling a collaborative care and cure cloud to enable continuous coordination of patient-centered care activities by a multidisciplinary care team and patients/informal care givers. A Personalized Care Plan Development Platform will allow, for the first time, collaborative creation and execution of personalized care plans for multi-morbid patients through systematic and semi-automatic reconciliation of clinical guidelines, with the help of Decision Support Modules for risk prediction and stratification, recommendation reconciliation, poly-pharmacy management and goal setting.

This project has been purposely devoted to diabetes, heart failure, renal failure and depression diseases, in different comorbidity combinations. Pilots will operate for 15 months in 3 European regions with diverse health and social care systems and ICT landscapes. This will allow for strengthening the evidence base on health outcomes and efficiency gains.

An international clinical advisory board has tightly driven the clinical objectives of the project in a tight manner. C3-Cloud patient pathways and organizational models validated by patient organizations and a clinical reference group, as well as change management and training guidelines, will be shared with the European community. Commercial exploitation of C3-Cloud integrated care solutions will be facilitated through an Industry Vendor Forum and commercial EHR/PHR products of 3 leading SMEs.

In this report we present the results of tests and evaluation of the C3-Cloud components from different clinical institutions.

1.2 Purpose

The purpose of Deliverable D9.3 is to report the results of the testing and the evaluation study of the C3-Cloud components. Based on the testing criteria defined in deliverable D9.1, the requirements to be tested are identified in the requirements traceability matrix delivered in D3.2 and D3.3, the user scenario descriptions and the Pilot Application User Requirements (PAR) defined in deliverable D8.1. It presents the evaluation methodology and reports on the results of the evaluation performed at the different pilot sites of the C3-Cloud project.

1.3 Scope and Context

Work Package 9 is responsible for the evaluation of the C3-Cloud components and pilot application. This is a complex undertaking due to the manifold aspects, clinical, technical and organizational that need to be taken into consideration, that is:

- Defining a 4-layered approach that is able to evaluate the complex clinical, technical and organizational nature of the C3-Cloud components and pilot application
- Defining an approach that is able to predict and model the impact of the application when implemented at scale
- Assuring the quality and correctness of C3-Cloud components by continuous testing activities
- Organizing user training workshops prior to and at the beginning of pilot application validation
- Testing and evaluating the C3-Cloud pilot application by professionals, patients and informal caregivers for 15 months

- Modeling the impact of the C3-Cloud integrated care pilot application compared to as-is situation
- Informing WP2 with appropriate measures especially on innovation and business aspects

1.4 Approach

Taking into account results of the Pilot Application Requirements review, we considered 51 out the 60 Pilot Application User Requirements (PARs) identified in D8.1.1 and the “Traceability Matrix” (D3.2). A refined DELPHI method was proposed for the application testing criteria assessment and reporting in deliverable D9.3.

1.5 Abbreviations and Acronyms

Table 1 Abbreviations and Acronyms

Abbreviation / Acronym	Definition
BC	Basque Country (pilot site)
C3DP	Coordinated Care and Cure Delivery Platform
DoA	Description of Action
her	Electronic Healthcare Records
MDT	Multi-Disciplinary Team
PAR	Pilot Application Requirement
PCPDP	Personalized Care Plan Development Platform
PEP	Patient Empowerment Platform
PHI	Personal Health Information
QUIS7	Questionnaire for User Interaction Satisfaction, Seventh edition
RJH	Region Jämtland Härjedalen (pilot site)
SIS	Semantic Interoperability Suite
SPS	Security and Privacy Suite
SQuaRE	Software product Quality Requirements and Evaluation
SWFT	South Warwickshire NHS Foundation Trust (pilot site)
TIS	Technical Interoperability Suite
UI	User Interface

2 C3-CLOUD EVALUATION BACKGROUND

The C3-Cloud application consists of a variety of components: the Personalized Care Plan Development Platform (PCPDP); the Coordinated Care and Cure Delivery Platform (C3CP); the Patient Empowerment Platform (PEP), Clinical Decision Support Modules (CDSM); Interoperability Middleware (including technical and semantic interoperability as well as privacy and security middleware). The component testing protocol, as described in D9.1, gives instructions to test all C3-

Cloud software components if they meet the functional and non-functional pilot application requirements (PAR) as detailed in D9.1.

2.1 Scientific background

The leading research question for the evaluation of the technology trial of the C3-Cloud application is therefore:

« Is the use of a personalized ICT tool that facilitates coordinated care planning, treatment optimization and patient self-management acceptable to patients with multiple long-term conditions and their team of health professionals? »

This research question will be answered by means of four evaluation layers that will be applied in the context of the C3-Cloud technology trial. This approach helps to answer sub-questions as defined below for each evaluation layer:

Evaluation layer 1: End-users from the three pilot sites have been actively involved in the identification of the pilot application requirements (**PAR**) (see deliverable D8.1) and in the proposal of the organizational model changes, which enable the delivery of patient-centred care supporting C3-Cloud care model.

In addition to that, evaluation layer 1 involved 26 patients and 22 MDTs in the pilot sites in order to test the user-centred design of the C3-Cloud components. Furthermore, ICT experts from the C3-Cloud technical partners will use protocols to carry out component testing and application testing to ensure that functional and non-functional requirements are met.

Sub-questions to be answered in layer 1 evaluation include:

- What are the requirements and needs that C3-Cloud users have for using the software? (This is an iterative approach in which C3-Cloud users are presented the new developments and can express their opinion.)
- Are the requirements met by all components?
- Are all application components well integrated?

Evaluation layer 2 studies the usability and usefulness of the C3-Cloud components. Layer 2 evaluates the usability and ease of use of C3-Cloud software components for the end users by involving health ICT experts from the University of Warwick, 27 patients and 20 MDT members (Table 2) in each pilot site. An adapted version of the QUIS7 questionnaire will be used, complemented by qualitative elements such as interviews and user observations, to understand the how and why of user behavior and the usefulness of the C3-Cloud application.

Sub-questions to be answered in layer 2 evaluation include:

- What are usability issues of the C3-Cloud platforms at this early stage?
- Where is improvement needed?

Table 2 Recruited participants for Layer 1 and Layer 2 evaluation studies

Pilot Sites/ Participant Profiles	Layer 1 – User Centred Design		Layer 2 – Usability / Usefulness		
	Patients	MDT members	Health ICT Experts	Patients	MDT members
South Warwickshire (SWFT)	5	7	4	13	12
Basque Country (BC)	9	11	-	2	6
Region Jämtland Härjedalen (RJH)	12	4	-	12	2
Total	26	22	4	27	20

Evaluation layer 3 evaluates the user experience, satisfaction and acceptability of the C3-Cloud application and patient training material by means of a technology trial in the three pilot sites. Early, face-to-face feedback from test users was already collected during the training sessions for the application and usability testing in M25. The feedback is reported in this deliverable D9.3 as “unstructured feedback” to support technical partners enhancing the functionalities and usability of the final C3-Cloud platforms.

The study is divided in a pre-trial phase, a trial phase and a post-trial phase:

- Evaluation layers 1 and 2 are carried out before the trial (M1 – M26)
- Evaluation layer 3 will be carried out during the 15-month trial (M30 – M45)
- Evaluation layer 4 will be carried out during and after the trial (M30 – M48).

Figure 1 presents the list of evaluation means and questionnaires including an indication when they will be used for the different evaluation layers with the patients, informal caregivers and MDT members. The full questionnaires can be seen in the Appendices of D9.2.

The list of each evaluation means is indicated on the y-axis, the x-axis indicates the project months for the sequence of each evaluation. Layer 1 is highlighted in blue bars, layer 2 in turquoise bars, layer 3 in olive bars and layer 4 highlighted in purple bars.

The total study duration is from M1 - M45, which includes the evaluation layers 1 to 4. Evaluation layers 1 and 2, however, have started already in M1 with tasks T8.1 and T4.2 on the user-centred design, design of use cases and organizational models, informed by feedback of patients and MDT members.

Layers 1 and 2 will be finalized approximately by M26. The results of layers 1 and 2 will be presented in deliverable D9.5.

The technology exploratory trial (layer 3 and 4 evaluation) however has duration of 15 months, starting from M30 until M45. The results of this research are anticipated to become available by the end of M48.

Table 3 presents a project month reference table. If this document refers to, for example, M30, this means October 2018.

Table 3 Project Months reference table

Month	Year	Project Month	Month	Year	Project Month
May	2016	1	May	2018	25
June	2016	2	June	2018	26
July	2016	3	July	2018	27
August	2016	4	August	2018	28
September	2016	5	September	2018	29
October	2016	6	October	2018	30
November	2016	7	November	2018	31
December	2016	8	December	2018	32
January	2017	9	January	2019	33
February	2017	10	February	2019	34
March	2017	11	March	2019	35
April	2017	12	April	2019	36
May	2017	13	May	2019	37
June	2017	14	June	2019	38
July	2017	15	July	2019	39
August	2017	16	August	2019	40
September	2017	17	September	2019	41
October	2017	18	October	2019	42
November	2017	19	November	2019	43
December	2017	20	December	2019	44
January	2018	21	January	2020	45
February	2018	22	February	2020	46
March	2018	23	March	2020	47
April	2018	24	April	2020	48

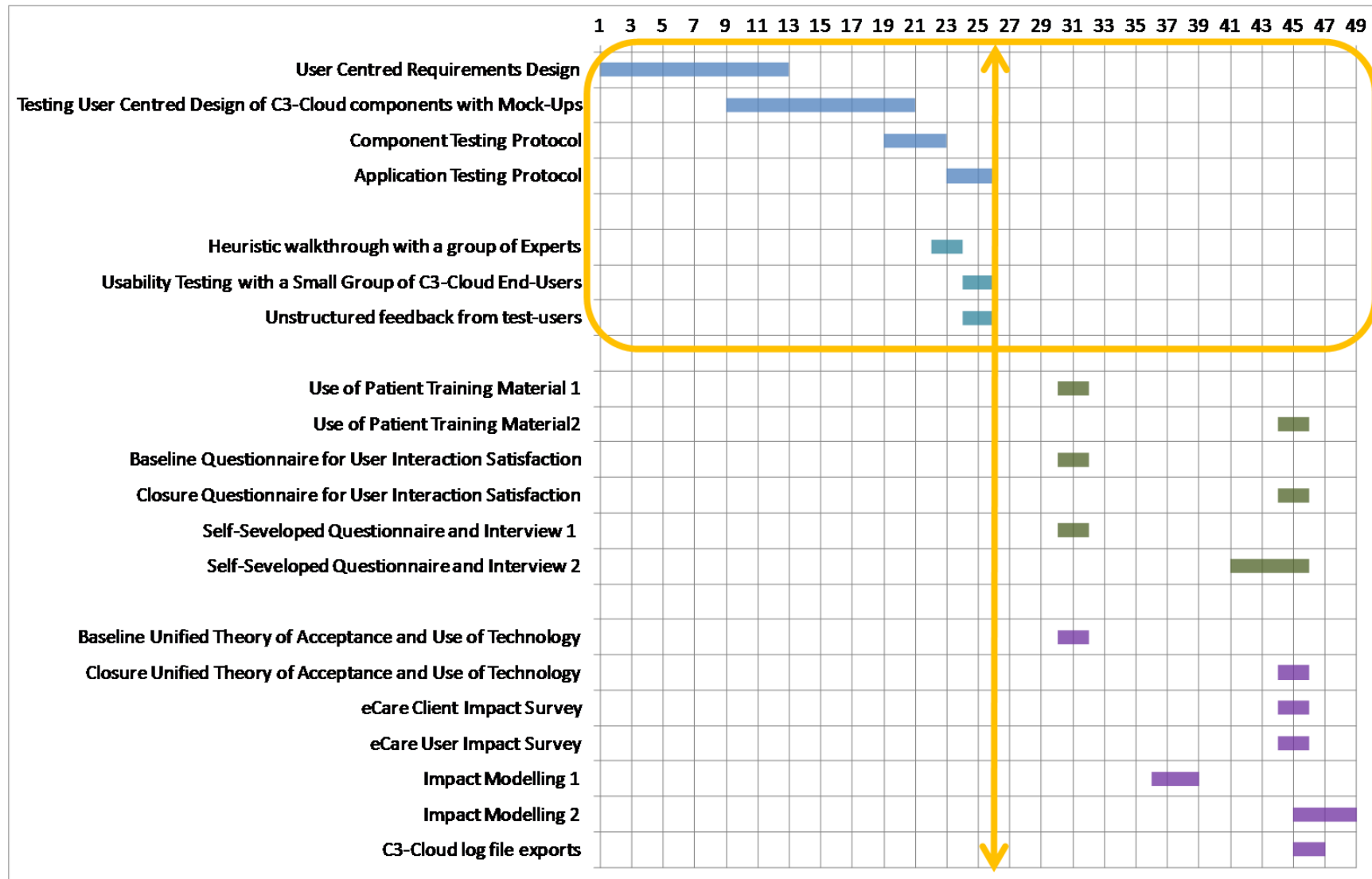


Figure 1: Timeline of evaluation phases (without preparation phases)

2.2 Objective of the evaluation

The objective of this evaluation is, to evaluate the user-centred design, the usefulness, usability, feasibility, and user experience of the C3-Cloud pilot application among patients, their next-of-kin caregivers and MDTs. In addition, a number of C3-Cloud application outcome propositions will be monitored and the C3-Cloud impact will be modelled for large-scale deployment of the C3-Cloud application.

2.3 Context of the evaluation

The principal standard steps of the C3-Cloud evaluation strategy are as follow: prepare, establish, specify, design, execute and report. C3-Cloud application and component evaluation, includes the evaluation of the integration of C3-Cloud components and functional testing of the application as a whole and evaluates if all C3-Cloud components work well together. Application testing is linked to usability studies and it considers how people interact with the software.

2.3.1 C3-Cloud platform

C3-Cloud will establish an ICT infrastructure enabling a collaborative care and cure cloud to facilitate continuous coordination of patient-centred care activities by a multidisciplinary care team and patients/informal care givers. Based on our Description of Action, C3-Cloud aims to facilitate the realization of its objectives through the implementation of the following high-level components:

- ***A Personalized Care Plan Development Platform*** that enables the development of personalized care plans for multi-morbid conditions through systematic and semiautomatic reconciliation of digitally represented clinical guidelines for individual chronic conditions, by a group of collaborating health and social care givers, and with the informed participation of the patients and their informal care givers
- ***A Coordinated Care & Cure Delivery Platform*** as an innovative online means for multidisciplinary care team members (MDT) to collaboratively manage (execute, monitor, update) the integrated personalized care plans for patients with multi-morbid conditions
- ***Clinical Decision Support Modules*** to support personalized care plan development and execution by clinical guideline reconciliation, risk stratification, poly-pharmacy management and goal setting and monitoring
- ***A Patient Empowerment Platform*** to ensure active participation of patients and their informal care givers to the management of their multi-morbid chronic conditions alleviating the non-adherence problem
- ***Interoperability Middleware*** addressing *technical, semantic and privacy/security interoperability* challenges to seamlessly integrate with the existing health care, social care and home/community care information systems for enabling patient-centric interoperable care coordination in an informed manner with the involvement of all stakeholders. The high-level interaction of these components with each other and their distribution to work packages are depicted Figure 1 and Table 2 as envisioned in the DoA.

2.3.2 Organizational setting

Pilot Site 1 - South Warwickshire, United Kingdom

Background and targeted population. South Warwickshire NHS Foundation Trust (SWFT) is a vertically integrated healthcare provider, offering acute hospital services to the population and

integrated community and children's services across the whole county. Warwickshire ICT Services is a division of SWFT and provides ICT services to all GP practices across the county, as well as to the Trust. This unique support arrangement enables Warwickshire ICT Services to act as an intermediary between acute, community and primary care services across the whole county and serve a total population of 550,000.

Warwickshire has an elderly population of over 20 % (113,000). An estimated 1 in 3 people in Warwickshire are living with one or more long-term conditions, in South Warwickshire this equates to 70,000 people. Currently 12.2% of the total population in Warwickshire is estimated to be living with cardiovascular disease (CVD), whilst 5.6% of the adult population is estimated to be living with coronary heart disease (CHD) and 2.6% with stroke. 7.3% of the population is estimated to have diabetes, and if current trends persist the total prevalence of diabetes is expected to rise to 8.1% by 2020 and 9.1% by 2030.

Care providers and organization. The total workforce of SWFT is over 3,700 staff working across 220 sites, including 76 GP practices. SWFT provides nationally recognized innovative services to help patients to stay out of hospital, including a Community Emergency Response Team (CERT) and Discharge to Assess (D2A). In D2A, the Trust utilizes 40 beds in local care homes to assess what a patient's long-term needs are. Building on joint work with social care workers, a new "Trusted Assessment" approach has been adopted, which allows packages of care to be restarted without a full assessment having to be repeated by social services.

ICT landscape. SWFT adopted the "Lorenzo" enterprise Electronic Patient Record (EPR). Initially an administration system, it was expanded in 2015/2016 to include order communications, clinical documentation and electronic prescribing. Lorenzo currently has no 'mobile' capability, so the Trust has developed an in-house PHP Web and iOS application for use by the community nursing teams. The Global Assessment Platform system is developed on open source components and provides electronic scheduling and assessments capability in an on and offline mode. GP practices across South Warwickshire are moving to a single IT provider, Egton Medical Information Systems (EMIS). There is currently no integrated countywide patient record accessible to all relevant agencies and no widespread use of telehealth or telemedicine technologies. SWFT delivers integration between information systems, using a Trust hosted Orion Rhapsody engine, which supports all versions of HL7, as well as numerous other data interchange formats such as email, bulk file import and export, and XML. This is fully HL7 CDA R2 and NHS Interoperability Toolkit (ITK) compliant.

To-be scenarios. The C3-Cloud integrated care solution will initially be piloted at the Rother House Medical Centre in Stratford, South Warwickshire. This Practice has a total list of 13,600 patients and anticipates that between 400 and 500 have complex multiple long-term conditions that could benefit from the C3-Cloud solution. With the help of C3-Cloud, patients will be stratified to target those who are at the highest risk of hospital readmission and volunteers are sought from that group. The local ethics committee to ensure appropriateness of patients and data processing will assess ethical factors. These patients will be reviewed during existing MDTs and developed alongside the existing Care Coordination project, which brings together GPs, community nurses, mental health nurses and social workers to specifically support patients with long-term conditions. Once the solution has been tested it will be rolled out to at least two additional GP practices after the end of the project.

Integration with the GP system, EMIS, and the Trust EPR, Lorenzo, will provide the easiest access to medication histories and ensure that the solution remains closely focused on the patient. SWFT is very interested in C3-Cloud care pathways for patients with multi-morbidity to be used across primary and secondary care. Poly-pharmacy decision support modules will allow systematically taking into account co-morbidities. Overall, SWFT would like to reduce hospitalization of patients with multiple co-morbidities and increase adherence to treatment and medication regimes.

Pilot Site 2 - Basque Country, Spain

Background and targeted population. Osakidetza, Basque Health System, has a target population of 2.17 million inhabitants. In 2016 more than 21% (>458,000 inhabitants) of the total population was older than 65, more than 28% had one or more chronic conditions and 1.5% of the population had been stratified as complex and multi-morbid.

Care providers and organization. Osakidetza includes 13 Integrated Care Organizations with an unique management team (OSIs), 4 University Hospitals, 7 Regional Hospitals, 2 long-term Hospitals, 3 Integrated Mental Health Networks, Emergencies and Basque Country for transfusions and human tissues. In 2014, the structural staff of Osakidetza consisted of 6,313 physicians, 8,227 GP nurses, 4,022 auxiliary nurses and others (7,245). Chronic Disease Management Programs exist for multi-morbid patients as well as for diabetes, COPD and heart failure. The Active Patient Program (inspired in the Stanford methodology) is used in the Country and is widely available in the country. Kronik On program has been developed for empowering multi-morbid patients based on the Stanford methodology.

ICT landscape. EHR service and inter-consultation functionality is provided through different systems (Osabide AP in primary and Osabide Global in secondary care). The e-Prescription service Presbide is provided by an unique system in both care sectors. This system has been integrated as a module within the EHR systems (Osabide Global and Osabide AP). The Personal Health Record service is provided through the Personal Health Folder (PHF) system.

Osakidetza uses a service-oriented architecture (SOA) specifically the Oracle SOA Suite platform. Osakidetza e-health applications are interoperable with UDDI v3 compliant services and JMS/MQ based middleware. Security mechanisms are implemented at protocol (SOAP), message (WS-Security) and transport (TLS) layers. HL7 CDA is used as the content standard in the e-prescription, EHR and PHR systems. ICD-9 and ICD-10 are the widely used international terminology systems.

To-be scenarios. C3-Cloud will be piloted at 5 Integrated Care Organizations (OSIs): Alto Deba, Araba, Bilbao-Basurto, Eskerraldea Enkarterri Cruces, and Donostialdea. Data from the last (2015-2016) stratification process in Basque Country, has shown 65,669 people with the highest risk prediction index for healthcare resource consumption.

Several OSIs have deployed a care pathway for multi-morbid complex patients starting in 2012. The AS-IS situation for multi-morbid elderly assumes 4 main situations of the patients: “stable patients out of hospital care”, “unstable patients out of hospital care”, “hospital discharge preparation” and “in hospital care”.

Information and organizational flow solutions need to be put into place to avoid silo effects in these process care pathways, which remain novel and in constant optimization. This will also provide a common ground for the development (when the patient is stable and out of hospital care) and/or optimization of integrated and personalized care plans (when the patient is in any of the other three situations). Without a common platform, difficulties arise from care fragmentation and lack of communication (DSS solutions from C3-Cloud are crucial). C3-Cloud is also expected to increase the information that patients have access to regarding their health and treatment, by providing access to their personalized care plan. The tele monitoring service will be extended to a wider spectrum of patients and healthcare professionals. The Empowerment Platform will facilitate the collection of self-reported parameters.

Pilot Site 3 - Region Jämtland Härjedalen, Sweden

Background and targeted population. The County Council Region Jämtland Härjedalen (RJH)

covers a population of 126,000 inhabitants of which 23% are elderly people (65+). The population is spread over a large area of 53,753 km². A joint project between the County's municipalities and RJH identified 4,930 persons (18% of the 65+ population) to be elderly with comprehensive hospital (>3 hospitalizations/a) or home care needs (>7 out-patient specialist care/a). 3,686 patients are in the national Swedish diabetes register (12.7% of this age group). 85.7% of these diabetic patients also have treated hypertension and 30.8% retinopathy. With the exception of diabetes, the exact frequency is seldom known.

Care providers and organization. The County's only hospital is located in the only town Östersund and the most remote healthcare centers are located almost 400 km away. Primary care is provided in 28 healthcare centers and secondary care at the hospital. Tertiary care is provided in collaboration with other county councils at a university hospital (Umeå) 450 km away. The hospital has 12 ambulances spread over the county and one helicopter. Social and home care are provided by the municipalities, and the collaboration with the Region's primary and secondary care is well-established.

RJH employs 358 doctors, 922 nurses and 546 nurse assistants. Most of the care of patients with chronic diseases is provided by family physicians in cooperation with district nurses at health care centers. They coordinate the care given at the secondary care level. If patients have a need for care in their homes, a district nurse together with a nurse assistant are provided by the municipality. The doctor from the health care center and the district nurse from the municipality have regular meetings. Patient education programs and group activities exist for patients of some chronic diseases, e.g. diabetes.

ICT landscape. There is a national and partly local website (www.1177.se) that is intended to be the patient's first contact point with the care system. The website also includes education and information. Fully integrated electronic health records are used in all health care centers and at the secondary care level since more than 20 years. The region has recently changed its electronic health care system to Cosmic® by Cambio, a C3-Cloud beneficiary. Cosmic® is based on pre-European standard Health Information Service Architecture (HISA), supports openEHR archetypes as core information models, and uses HL7 v2 and v3 messages for inter-system communication. Electronic prescription is achieved through Cosmic® and the national data system. RJH allows all patients' access to their records through EHR in 2016-2017.

Municipalities have separate electronic health care systems, presently with no integration to Cosmic. Social care records are kept separately. All caregivers have access to and daily use of electronic health records / home care records. ICD-10 is used for hospitalization and in primary/secondary care; DRG in secondary care. Within home care, wireless telemonitoring is used e.g. to register access by caregivers to the patients' home.

To-be scenarios. Due to many combined challenges of the county, there is political, economic and demographical pressure to reform the healthcare chain. The overall wish from both stakeholders and end-users is to develop integrated care. RJH will conduct the tests at 9 healthcare centres (public and private) and in 3 municipalities. The locations are in rural as well as urban settings.

2.3.3 Participants recruitment

For the evaluation studies of C3-Cloud, the balance between men and women will be preserved during patient recruitment in all three pilot sites. The multi-disciplinary teams composed of health and social caregivers will also have a balanced distribution.

Among our pilot sites, RJH has predominantly female caregivers, amongst nurses, nurse assistants and rehabilitation personnel approximately 85% are women.

The sex distribution among doctors is fairly equal, 50% each. Osakidetza has predominantly female

caregivers, amongst nurses, nurse assistants and rehabilitation personnel approximately 84% are women. The sex distribution among doctors is almost equal but this will change in the next years because the number of female medical students is higher. A similar distribution exists in South Warwickshire care work force.

From an epidemiological standpoint gender issues have long been neglected. Especially conventional tele-health trials have often explicitly or implicitly excluded women. C3-Cloud explicitly includes the issue of gender. As an example, unlike systolic heart failure where the treatment of the underlying coronary artery disease and its consequences is the primary objective, in diastolic heart failure the treatment of concomitant diseases is necessarily moving into the center, which particularly affects women, as they are more likely to suffer from diastolic heart failure. Gender analysis will be performed in user studies and evaluation studies in WP9 to understand the differences in the effectiveness of C3-Cloud integrated care solutions in terms of for example clinical outcomes, patient activation and psychosocial improvement on men and women.

Pilot site 1 - South Warwickshire, United Kingdom

The patients who were involved in the PEP testing were recruited from the Rother House Medical Centre. It should be noted that these patients are representatives of the Rother House patient forum, and they are generally well educated and some of them are regular users of IT. Therefore, they were asked to conduct the testing from their own perspective but also to think about how patients who are less familiar with IT might perceive the system.

The healthcare professionals who were involved in the C3DP testing were recruited from acute and community services from the South Warwickshire NHS Foundation Trust.

Pilot site 2 - Basque Country, Spain

Patients and the health care professionals (GPs and Nurses) from Primary Care were recruited from three of the OSIs involved.

Pilot Site 3 - Region Jämtland Härjedalen, Sweden

Patient recruitment methods emanates from the geographical areas and include healthcare centres, home and special accommodations. Special focus was placed upon sparsely populated areas. Health and social care workers from primary/secondary care and the municipalities form the multi-disciplinary teams to take part in C3-Cloud.

2.4 Evaluation methodologies

Four-combined methods have been used for the C3-Cloud application and component evaluation.

For the **Component testing**, the headings of IEEE 829 Standard's templates have been merged for the testing results.

For the **Usability studies**:

- The *application evaluation* has been made by using a “refined Delphi method”.
- The *usability and usefulness* have been made by using both the “product reaction cards” method and the “Questionnaire for User Interaction Satisfaction (QUIS)” method.

2.4.1 The IEEE 829 Standard's templates

The IEEE 829 standard specifies the form of a set of documents for use in software and system test documentation. Referring to D9.1, each component's testing will be documented in a set of six documents: test plan, test design specification, test procedure, test log, test incident report and test summary report. The standard specified the format of these documents, but did not stipulate whether they must all be produced, nor did it include any criteria regarding adequate content for these documents. These were a matter of judgment outside the purview of the standard.

Following the discussion with involved technical partners related to component testing and reporting for D9.3, it was decided to check and merge the IEEE 829 document templates by focusing on the most relevant points with respect to the current state of the C3-Cloud project. Overall, we produced the following 2 documents:

1. Component Test Plan and Design – The overall plan and design for testing;
2. Component Test Results – The results of running the tests (summary reports, logs, incident reports).

2.4.2 The Delphi method

The Delphi approach permits *«to obtain the most reliable opinion consensus of a group of experts by subjecting them to a series of questionnaires in-depth interspersed with controlled opinion feedback»* (Dalkey & Helmer, 1963). Based on this definition, we adapt the Delphi method following steps below:

Brainstorming: In a first round, a list of Questions Proposal formulated in concordance with the Pilot Application Scenario Requirements identified in D8.1 will be sent to the evaluation participants. This is to formulate an initial list of relevant questions for which we will evaluate the pertinence and the understanding of the questions. The experts give their feedback with a neutral point and they can validate, modify, delete or add questions with the justifications and arguments.

Refining and prioritization: In the second round, the median and histogram of the first answers on the agreement of each question proposal is given. Participants will be asked to:

- confirm or modify their first notes of agreement for each question and comment on their positioning especially in cases where they modify their vote.
- give for each question, a second note of the relevance of the question proposals from "5, very important" to "1, not important".

Analysis: We will communicate the validated questions with their degree of relevance. Then both MDT members and patients will be asked to make further comments on these proposals based on the results achieved.

For the application evaluation, we used the brainstorming step to obtain a set of relevant questions used to build the questionnaires. After receiving experts' feedback the refining and prioritization have been made internally due to the timeline we had. And the, questionnaires have been built and send to participants via Internet, for the analysis.

2.4.3 The product reaction cards method

The principle of the “product reaction cards” method is that it does not rely on a questionnaire or rating scales and users do not have to generate words themselves. The participants were asked to pick the words that best describe the product or how using the product made them feel. The expert participants write then a report with the 5 words selected, including some comments.

2.4.4 The Questionnaire for User Interaction Satisfaction (QUIS)

The Questionnaire for User Interaction Satisfaction (QUIS) is a tool developed by a multi-disciplinary team of researchers in the Human-Computer Interaction Lab (HCIL) at the University of Maryland at College Park in 1988 in order to assess the users' subjective satisfaction with the human-computer interface. It measures attitude towards the following interface factors: screen factors, terminology and system feedback, learning factors, system

capabilities, technical manuals, on-line tutorials, multimedia, voice recognition, virtual environments, internet access and software installation. In addition to English, the questionnaire in its seventh version (QUIS7) is available in Spanish. It has been translated to Swedish by a C3-Cloud partner at the Region Jämtland Härjedalen (RJH) pilot site. QUIS, in general, have been used in a medical research paper titled “Measurement of CPOE End-User Satisfaction Among ICU Physicians and Nurses [1]” and recently a mobile application evaluation titled “Usability evaluation of mobile applications using ISO 9241 and ISO 25062 standards.[2]” By applying the questionnaire the aim is to improve the usability of the platform. In the scope of C3-Cloud layer 2 evaluations, the QUIS 7.0 was used for both MDT members and patients. The results presented in this deliverable are used for shaping the design and redesign of the platforms, discovering the potential areas for the improvement, and the comparative evaluation of the platform from its current status and later during the technology trial.

[1] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3059318/>

[2] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4851667/>

3 COMPONENT TESTING

3.1 Component testing overview

Check and verify that the implemented component functionalities meet the specified requirements. The technical requirements were first created in tasks T3.2 and T3.3 and have been updated a few times as part of task T3.4.

The test plan objectives are:

- Define the scope of what will be tested;
- Specify the approach taken to testing;
- Specify how the testing results will be evaluated.

References Standards and deliverables:

- IEEE Standard 829-1998, Standard for Software Test Documentation Deliverables
- D3.2 “Requirements Specification of the C3-Cloud Architecture”
- D3.3 “Conceptual Design of the C3-Cloud Architecture”
- D8.1 “Use Cases and Requirement Specifications of the Pilot Application”
- D9.1 “Functional and Non-Functional Testing Criteria for C3-Cloud Components”

Within the scope of Task 3.4, the Pilot Application Requirements (PARs) of D8.1 and the Requirements Traceability Matrix (RTM) of D3.2 and D3.3 have been reviewed and updated by May 2018.

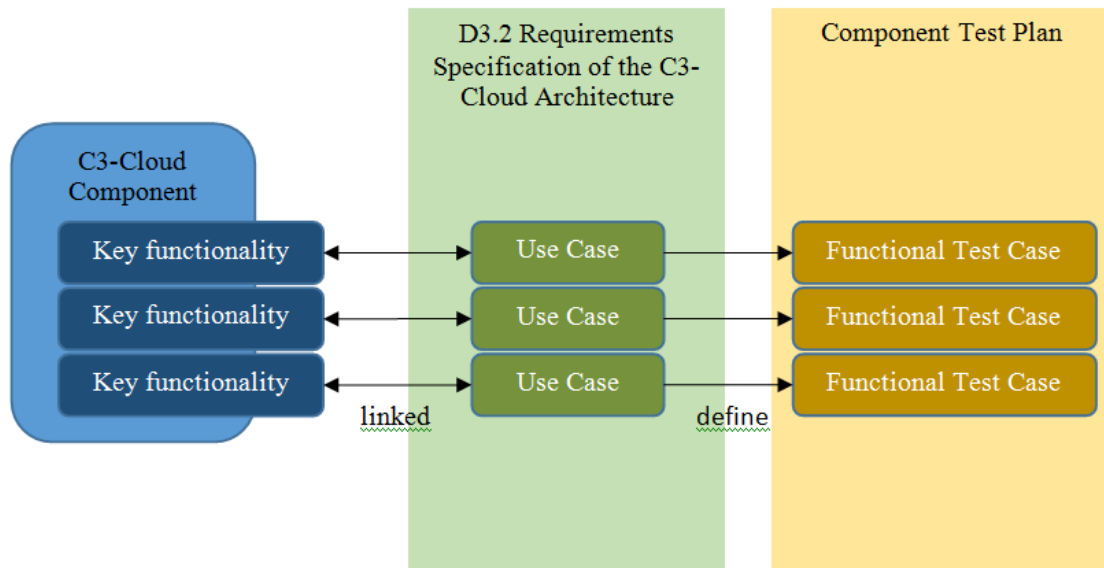


Figure 2: Model of a functional test case definition workflow

3.2 Component testing process and results

Table 4 summarizes overall component testing plan and obtained results. Furthermore, a detailed description of “Test Plan” and “Test Result” complying with IEEE 829 Standard’s templates were produced by respective component owners (see Appendices 10.1 and 10.2).

Table 4 Summary of Component testing process and results for discussion

Components	C3DP	PEP	CDSM	Interoperability Middleware: TIS, SIS and SPS
<p>Evaluation method used</p> <p>(changes, unexpected events and observations)</p>	<p>For all six components, the IEEE 829 Standard's templates were used. It specifies the form of a set of documents for use in software and system test documentation.</p> <p>Referring to D9.1, each component's testing has to be documented in a set of the following six documents: test plan, test design specification, test procedure, test log, test incident report and test summary report. The standard specified the format of these documents, but did not stipulate whether they must all be produced, nor did it include any criteria regarding adequate content for these documents.</p> <p>Since these were a matter of judgment outside the standard specification, we held a discussion with involved technical partners for the reporting of component testing in D9.3. Following this, it was decided to merge the IEEE 829 standard document templates by focusing on the most relevant topics (e.g.: test data, tools, process, execution, results) with respect to current state of the C3-Cloud project. Each component owner produced the following 2 documents:</p> <ul style="list-style-type: none"> • Component Test Plan and Design, which summarizes the overall, plan and design for testing. • Component Test Results, which gathers the test data, test execution and obtained results. This also includes incident reports and a conclusion of the component testing. <p>Such approach permitted to obtain expected component testing results by focusing on key features to be tested within the C3-Cloud project. Each component owner checked and verified that the implemented component functionalities meet the specified requirements.</p> <p>On another hand, it was also proposed not to utilize the EuroRec quality-labelling Tool in deliverable D9.3 reporting due to the needed workload to enter manually data and the timeline constraint.</p>			
Application of the method by the involved partners	<p>Evaluation Team of the C3DP tests was composed of representatives from:</p> <ul style="list-style-type: none"> - SRDC as development and - test teams from WARWICK and CAMBIO- 	<p>Evaluation Team of PEP tests was composed of :</p> <ul style="list-style-type: none"> - 4 representatives from Medixine as 1 test manager, 2 development testers and 1 	<p>Evaluation Team of CDSM tests is composed by at least one representative from:</p> <ul style="list-style-type: none"> - WARWICK as development team of Heart Failure and Depression 	<p>Evaluation Team of the following Component tests is composed by at least one representative from involved partners:</p> <p>TIS:</p> <ul style="list-style-type: none"> - WARWICK as development team, - INSERM, SRDC, OSAKI, RJH, and SWFT as development team of linked components

	<p>WARWICK, CAMBIO, INSERM and MEDIXINE as development team of linked components</p> <p>For members of the test team, refer to Appendix 10.1.1.</p> <p>The testers followed the provided manuals that explain each functionality of C3DP and relevant applications like PEP.</p> <p>There has not been any change in the environmental testing setup described in the C3DP Test Plan and Design document.</p>	<p>expert.</p> <ul style="list-style-type: none"> - 1 representative from SRDC as development team of linked component. 	<p>guidelines</p> <ul style="list-style-type: none"> - CAMBIO as development team of Type 2 Diabetes guidelines and CDS engine - INSERM as development team of Renal Failure guidelines - SRDC as development team of C3DP 	<p>SIS:</p> <ul style="list-style-type: none"> - INSERM as development team, - SRDC and Warwick as development team of linked components - Pilot Site (OSAKI, RJH, and SWFT) - Project Management <p>SPS:</p> <ul style="list-style-type: none"> - SRDC as development team, - RJH as development team of linked Identity Provider
<p>Results</p> <ul style="list-style-type: none"> - strengths - weaknesses 	<p>All test cases of the C3DP were completed with SUCCESS. The results of execution</p>	<p>The overall PEP test result was completed with SUCCESS.</p>	<p>All test cases have been completed with SUCCESS.</p>	<p>No critical or medium level incidents did occur in any of the Interoperability middleware.</p> <p>All test cases have been completed with SUCCESS. Some minor</p>

	<p>of each test case are provided in the dedicated sub-section of the Test result document (see Appendix 10.2).</p> <p>Some anomalies were detected. Most of their impacts were either low (like I-C3DP-43) or medium (like I-C3DP-42) and very rarely high (like I-C3DP-41). Also, most of them were already fixed during the active component testing session, so that they were retested successfully. For each anomaly, even when solved during the testing, a corresponding incident record has been created.</p>	<p>Testing has been logged into the issue tracking solution used by Medixine (Microsoft VSTS).</p> <p>SRDC has been notified issues related to integration which were investigated. Only Low-level Impact incidents were identified. For example, “Timestamp handling in integration needs to be checked. Some inconsistent time zone handlings were encountered (a few hours difference in timestamp across components).” Overall description and status of the PEP testing incidents are reported in section Test results document.</p>		<p>issues were identified during first iterations of the testing. They were mainly due to the data content anomalies exposed by the test system of the pilot sites or FHIR structure requirements imposed by C3DP. The issues were fixed quickly, so that they were retested successfully during later iterations of the testing. Any issues being detected during the component testing were documented and analysed. Related parties were notified with fix suggestions when the root cause was identified. While most of the bugs were minor and were resolved quickly through email or video conferencing, more severe technical issues or longer-term feature requests are managed using the GitLab Issue Tracker system. GitLab is the main tool of the project for source version control.</p> <p>The main strength of these component testing is that they have been completed with SUCCESS by considering the functional and non-functional test cases for the C3-Cloud software components and within the scope of :</p> <ul style="list-style-type: none"> - Pilot Application Requirements (PARs) of D8.1 - Requirements Traceability Matrix (RTM) of D3.2. - last updates and revisions (May 2018) from both CRG and technical partners of D3.3 - the IEEE 829 Standard for Software and System Test Documentation. <p>No anomalies were observed during testing. This testing served to support component owners to resolve detected issues and avoid potential errors for future deployment of the C3-Cloud platform.</p> <p>The weakness is that it was performed as an interim evaluation so open issues might come up (refer to results). Even if main functionalities of the components are working, further</p>
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				<p>developments are expected to complete components features with respect to both end users (patients & MDTs) and technical partners.</p> <p>For example with the SIS both the structural and semantic mapper service data coverage need to be completed with respect to data samples and mapping tables provided by pilot sites.</p> <p>Pilot site testing were performed with RJH, further testing need to be performed in the context of both SWFT and BC.</p>
Further 'specific' Comments	<p>Testing is a continuous process. SRDC team continues to test their components and the integration with relevant C3-Cloud components or local systems via automated and manual testing, and the same process of incident tracking is applied until an issue is resolved.</p>	No Specific comments	No Specific comments	<p>Test executions of the Interoperability middleware were performed during the M18 (December 2017) project review meeting, for D9.3 they were retested successfully.</p>

4 APPLICATION AND USABILITY TESTING

4.1 Description of the application testing

Figure 3 (D9.2 Figure 3) describes the simplified application testing workflow, used for the evaluation. The workflow is based on a C3-Cloud key scenario linked to a use case and defined by an application testing criteria.

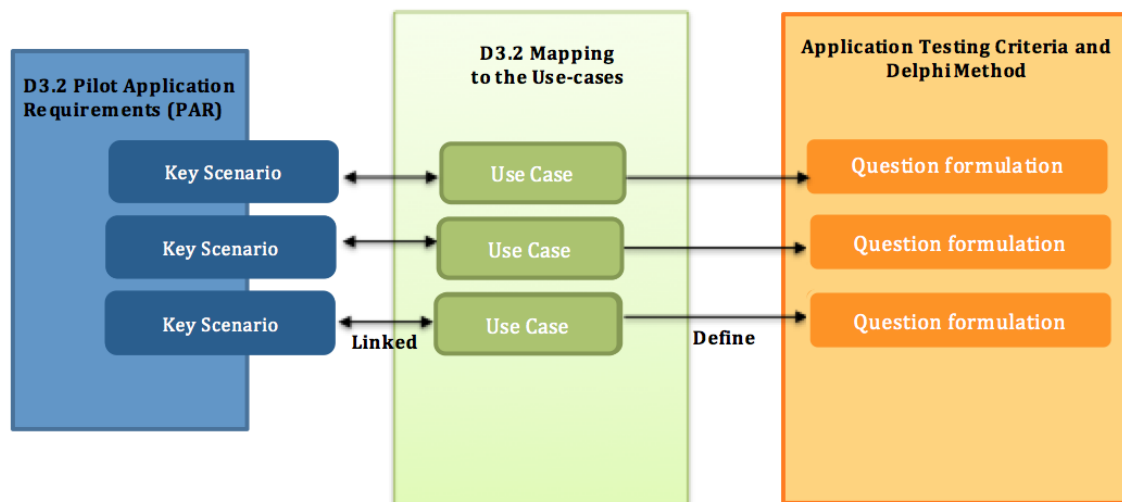


Figure 3: Simplified application test cases definition workflow from D9.2

4.1.1 Application testing plan and design

Based on the analysis of the « Pilot Application Scenario Requirements » (PARs) and the referenced used cases, the first step was to formulate a list of questions, starting by the simple mappings (1 PAR to 1 use-case) to be comfortable and be able to identify some possibly links between the PARs. The questions were then grouped by profiles identified during the PARs analysis process, in order to define a questionnaire per user profile. At this stage, we identified 4 profiles: Patient, Informal Care Giver, MDT Members and Health Professional.

After getting the 4 questionnaires, we had an internal review with 2 experts (clinician and ICT) from the INSERM team. Then we shared questionnaires with a group of experts from the 3 pilot sites. This was done in order to obtain feedback and revise formulated questions as described in the "Brainstorming" step of the "Delphi method".

Based on the feedback from the expert groups, the questionnaires have been merged into 2 in reference to the following 2 users profiles: MDT members and Patient & Informal Care Giver. The questions were reviewed and the irrelevant ones identified by the dropped PARs and the uncovered system functionalities were suppressed. In reference to the "Delphi method", this was the refining and prioritization step.

The questionnaires have then been defined via Internet links in order to facilitate the users' evaluation.

4.1.2 Uses-cases scenarios

The use-case scenarios demonstrate interaction between the C3-Cloud approach, patients and the wider multidisciplinary care team (MDT). The stories intend to present an overview of the present as-is care at each site, and ways that a C3-Cloud integrated care could improve care coordination even in these advanced regions. The scenarios are based on input from MDT members and patients at each of the three sites in accordance with the given instructions.

4.1.3 Pilot Application Requirements

From the scenarios, 60 different Pilot Application User Requirements (PAR) have been identified and have been mapped to different required high-level components; Patient Empowerment Platform (PEP), Personalized Care Plan Development Platform (PCPDP), Coordinated Care and Cure Delivery Platform (C3DP), Technical Interoperability Suite, Semantic Interoperability Suite, Clinical Decision Support Modules, Security and Privacy Suite, and in some cases to already existing local care systems. After reviews, we consider 51 different PARs for the questionnaires formulation.

4.1.4 Application testing questionnaires formulation

The process used for the questionnaire formulation can be summarized in 7 steps.

Step 1: Excel work document creation

Based on the Pilot Application User Requirements mapped to different components and use cases, we built an excel file to retrieve all the information needed for the questions formulation.

Figure 4 (from D9.2) describes the first Excel file draft built for the questions formulation., with the use case mapping of the Pilot Application Requirements identified in D8.1 and D3.2 with “Dimension”, “Application Testing Criteria” and “Question Proposal”.

Step 2: PAR mapping to use cases hierarchization

We identify the simples mappings (1 PAR to 1 use-case) to the complex ones (1 PAR to 2..N uses-cases) to be comfortable and be able to identify some possibly links between the PARs. A column NB has been added to the Excel file to count the use case per PAR;

Step 3: Questions formulations

The first step was to formulate a list of questions, starting by the simple mappings (1 PAR to 1 use-case). The formulation consisting of reading the PAR one by one, and all the use cases mapped to the related PAR. The objective was to be able, in one sentence, to summarize the requirement based on the use cases description. Figure 5 shows part of the final version Excel file draft built for the questions formulation.

Step 4: Users’ profiles definition

In order to define a questionnaire per user profile, the questions were then grouped by profiles during the PARs analysis process, At this stage, we identified 4 profiles: Patient, Informal Care Giver, MDT Members and Health Professional.

Requirement ID	Pilot Application Scenario Requirements	Mapping to Pilot Scenarios	Mapping to High Level components	Mapping to the Use Cases	Dimension	Application Testing Criteria	1 st round Questions Proposal -DELPHI-
PAR-23	As a Patient/Informal Care Giver, I want to be able to remotely get in touch with social care services	Basque Scenario- Encounter B	Patient Empowerment Platform	PEP-3.1: Communicate via Safe messaging PEP-3.2: Communicate via Video appointment	Organizational	<ul style="list-style-type: none"> – Acceptability – Effective Communication between Patient/Informal Care Giver and social care services – Time saving for clinical workload 	Does the system enable: <ul style="list-style-type: none"> – The patient to send messages to social care services – The social care services to send messages to patient? – The patient and social care service to reply to received messages thus continue an on-going conversation?

Figure 4: Excel mapping File (First draft)

Req. ID	Pilot Application Scenario Requirements	Nb	Dimension	Application Testing Criteria	1st Round Questions Proposal - DELPHI -	Links
PAR-1	As a Patient/Informal Care Giver, I need to access Patient Empowerment Platform to learn about treatment options, about how drugs work along with their benefits and side effects	x	Clinical Outcomes	Functionnal	Does the system enables the patient/informal Care Giver to : - Chose a specific self-management material? (drug interaction information) - Access to the chosen self-management material ? - Access to drug interaction information related to a specific disease ? - Access to drug interaction information related to more than one specific disease ? - Access to his treatment or alternatives, and treatment guidelines ?	PAR-1; PAR-22
PAR-2	As a Patient/Informal Care Giver, I need to access Patient Empowerment Platform to learn about my condition (when possible through interactive educational material)	x	Clinical Outcomes	Functionnal	Does the system enables the patient/informal care giver to : - Chose a specific educational material (e.g. interactives pages, video, records) - Access to the chosen educational material ? Does the illness information clearly enough ? Do you think thaht these information will help you to improve your health and wellbeing? (If NO, Specify / Mention) Do you think thaht these information will help you to make choices about your lifestyle? (If NO, Specify / Mention) Do you faces with any problem to get this information ? (If YES, Specify / Mention)	PAR-1; PAR-2; PAR

Figure 5: Excel mapping File (Final)

Step 5: Reviews (Brainstorming)

After getting the 4 questionnaires, we had an internal review with 2 experts, before sending them to a group of experts as a "Brainstorming" step in the Delphi Approach, in order to obtain a feedback and adjust the work previously done.

Step 6: Refining and Prioritization

Based on the feedback from the expert groups, the questionnaires have been merged into 2 in reference to 2 users' profiles: MDT members and Patient & Informal Care Giver. The questions were reviewed and the ones referring to dropped PARs and uncovered system functionalities were suppressed. This was the refining and prioritization step in reference to the Delphi approach.

Step 7: Questionnaires building via Internet

The questionnaires have then been defined via an online platform in order to facilitate the users' evaluation. The lists of implemented online application testing questions are reported in Appendix 10.3 for MDT members and Appendix 10.4 Patient & Informal Care Giver. For participant's responses to be taken into account in the evaluation, the participants had to respond to all questions online and validate the questionnaire at the end of the testing.

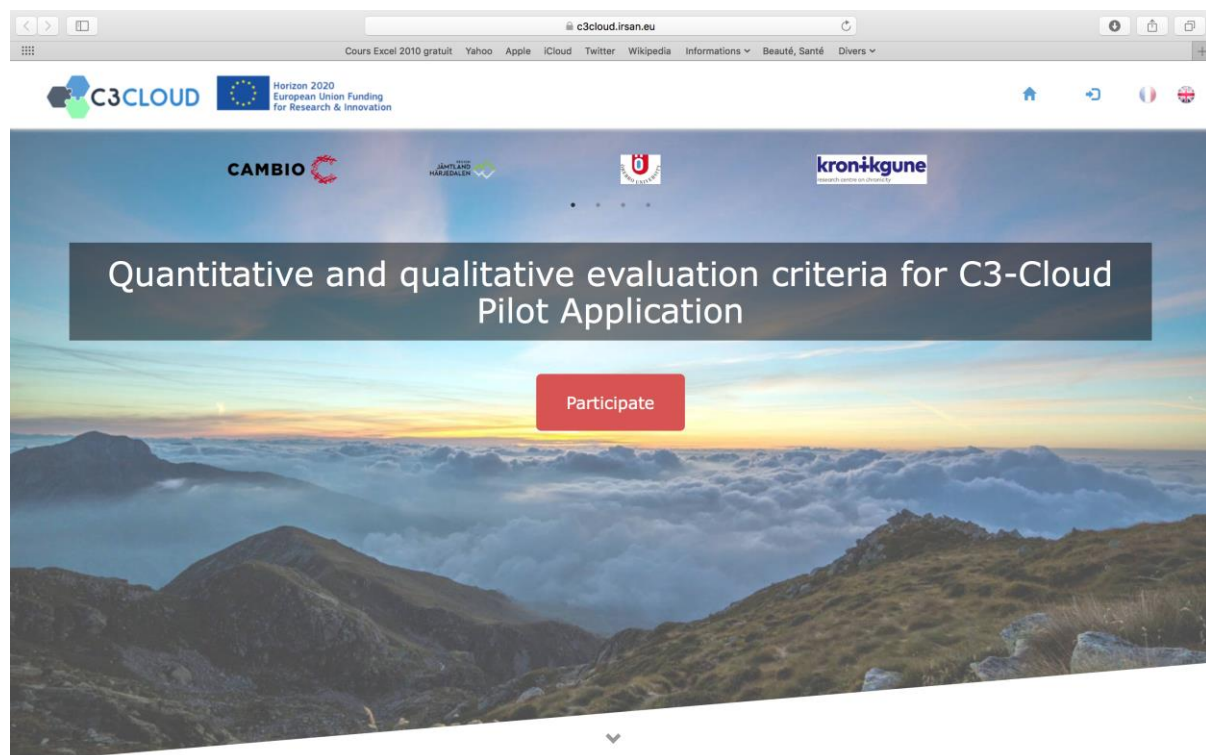


Figure 6: The online application testing questionnaires platform User Interface

4.2 Early usability evaluation Month 25

4.2.1 Sampling

The usability evaluation was performed together with the application testing. 20 MDT members and 27 patients responded to the QUIS7 questionnaire online for the C3DP platform and the PEP platform separately. The full set of items included in the QUIS7 questionnaire can be seen in Appendix 10.5.

The evaluation participants were recruited in the pilot sites among patients who speak English. This is crucial since the translations of the software components and the training material cannot be finalized until the high-level components are fully integrated. This in turn, is partly dependent on the early testing that was carried out in T9.2, as reported in this deliverable.

4.2.2 Description of the test session

The participants received login credentials for the online High Level Component demonstrators of the C3DP and the PEP and training material including a walkthrough that guides them through certain activities on the demonstrators. A language facilitator from the pilot sites moderated each session and was available for any question that was raised from the participants. Notes were taken during the test sessions to record the unstructured feedback given by the test users, in order to generate a summary report.

After the participants finalized the training, they were able to answer the QUIS7 questionnaire on their interaction satisfaction. The unstructured feedback and results of the QUIS7 questionnaire were fed back to the software development partners.

4.3 Application and usability testing results

Table 5 summarizes layer 1 and layer 2 evaluation processes and obtained results. Furthermore, a detailed description and analysis/graphs of “application testing” responses and “usability testing” results were produced by Inserm (see Appendix 10.4) and Empirica (see Appendix 10.5).

Table 5 Summary of Usability Studies process and results for discussion

Layer to be evaluated	Application testing	Usability and Usefulness
Used evaluation method	<p>Three-combined methods have been used for the C3-Cloud application and usability evaluation: The Delphi-method, the product-reaction-card-method and the QUIS questionnaire.</p> <p>For the Application testing, the evaluation has been performed using a “refined Delphi method”.</p> <p>Based on the analysis of the Pilot Application Requirements (PAR) and the referenced use-case scenarios, a set of questions has been set up which were grouped by profile. As defined in the Delphi Method, the questions were submitted to a group of experts from the 3 pilots sites, in order to refine and prioritize them. The final set of questions was then implemented as a questionnaire via an online platform in order to facilitate the evaluation.</p> <p>The evaluation of system usability and usefulness has been performed using both the “product reaction cards” method and the “Questionnaire for User Interaction Satisfaction (QUIS)” method.</p> <p>The “product reaction cards” is a fast and simple method used for an overall system evaluation, allowing the user to describe the system by choosing 5 words from a predefined set of words. With the QUIS questionnaire, users attitude towards the following interface factors was measured: screen factors, terminology and system feedback, learning factors, system capabilities, technical manuals, on-line tutorials, multimedia, voice</p>	

	recognition, virtual environments, internet access and software installation.	
Application of the method (Changes, unexpected events and observations)	<p>Overall 26 patients and 22 MDTs from the 3 pilot sites participated to the Application Testing.</p> <p>Referring to the DoA and D9.2, pilot sites had to recruit 15 patients (5 patients from each) and 30 MDT members (8 from SWFT, 8 from BC and 14 from RJH) to conduct layer 1 evaluation along application testing. The number of patients were fulfilled however recruiting the awaited number of MDT members were achieved at 73% due to recruitment difficulties to find the right MDTs. Specially in RJH where we got 4 MDTs participants instead of 14. Additionally, the English language of the C3-Cloud platform and materials were a barrier for both BC and RJH, which needed to translate questionnaires, user manuals and some of participants responses.</p> <p>For the Application testing questionnaire formulation, we did not apply the 2nd round Delphi method with pilot sites experts due to timeline constraints to obtain feedbacks from their reviews. Making the 2nd expertise round could help us to optimize the question formulations.</p> <p>As changes and unexpected events, the PARs and Requirements Matrix have been evolved during the entire project life. Some of them were deleted, after being included in questions formulations. An extra work has been performed in order to update the questions list</p> <p>We considered both functional and non-functional test cases for the C3-Cloud platform (C3DP and PEP) within the scope of last updates and revisions of PARs (May 2018) from the discussion involving the CRG and technical partners of T3.4.</p> <p>For the “product reaction cards” method, it does not rely on a questionnaire or rating scales and users do not have to generate words themselves. The 118 words list included positive words (e.g. Innovative, Engaging etc.), together with negatives</p>	<p>As outlined in deliverable D9.2, the 'layer 2 usability evaluation' aimed to include 40 patients and 52 MDT members in the early (i.e. Month 25) usability evaluation across the three pilot sites.</p> <p>However, it was not possible to reach the full number of test participants for this evaluation: The software components and user training material are meant to be refined based on the results of the usability testing. Thus, it would imply potential duplication of translation efforts if the software were already translated at this stage. In addition, the training material are highly interlinked with the content and interfaces of the C3-Cloud software components (with regards to screenshots and detailed guidance). Thus, it was decided to aim for recruitment of fluent English speakers in all three pilot sites for the test sessions.</p> <p>Overall, 27 patients and 20 MDTs from the three pilot sites participated in the usability test sessions. In addition, it was decided to obtain and note down 'unstructured feedback' from all test participants during the test sessions.</p> <p>The usability testing questionnaire (QUIS) helps identifying areas of usability and user interaction that could need further improvement or that need revision. While the QUIS is very structured and analyses specific areas, it lacks detail and reasoning 'why' specific areas lack usability. Thus, it is complemented with the 'unstructured feedback' which reflects unfiltered and very specific usability issues identified during the test sessions.</p>

	words (e.g. Frustrating, Time consuming etc.). The participants were asked to pick the words that best describe the C3-Cloud platform or how using the product made them feel. We limit the choice number to 5 words, as commonly used in such approach. At the end of the study, a scoring was made to identify the most commonly words by the participants to describe the system.	
Results - strength - weaknesses	<p>The efforts of this evaluation not only evaluate feasibility but also how to further improve the C3-Cloud application and its implementation.</p> <p>For the “product reaction cards” method, 48 people participated to the evaluation, choosing the 5 words that best described the system for them, without adding any particular comments.</p> <p>For the 22 participants of the MDT profile, 30% describe the system as "Collaborative", 16% find it "Comprehensive", 17% find it both “Empowering” and “Innovative” and 20% as "Time Consuming” (see Figure 7).</p> <p>For the 26 participants of the patient profile, 25% describe the system as "Useful", 21% find it both "Accessible and Convenient" and 17% find it Appealing and 16% find Advanced" (see Figure 8).</p> <p>In general, for all the 48 participants, the C3-Cloud system appears to be "Collaborative" at 23%, "Useful and Empowering" at 17%, "Innovative" at 15% and both "Complex" and "Comprehensive" at 14% (see Figure 9).</p>	<p>The results of the usability testing (QUIS) and the unstructured feedback are presented in chapter 4.3.1 and 4.4.</p> <p>Strengths of the approach taken are clearly that it allows for an early feedback to the software developers for further improvement of the software before starting the technology trial with an increased number of patients and MDT members in real settings. The combination of structured feedback (QUIS) and unstructured feedback (notes) from the test sessions complement each other.</p> <p>However, validity of test results may be reduces based on two main factors:</p> <ul style="list-style-type: none"> • the dependency on test participants fluent in the English language • the unequal distribution of test users across the pilot sites.
Further 'specific' Comments	Referring to the DoA and D9.2, the Software product Quality Requirements and Evaluation (SQuaRE) approach was the first choice for the Application testing. However, a refined Delphi approach was then used due to the project timeline and participants recruitment process. In fact, we could not perform the 2 nd step of the Delphi method consisting to exchange with experts to review	

	and score the questions. To overcome this the platform developer reviewed questionnaires internally with respect to current status of their product (both SRDC and Medixine experts reviewed overall questionnaires considering the C3DP and PEP development) also we added NA responses for all questions to respond Not Available functionalities (C3DP and PEP) for both the Patients and MDTs.	
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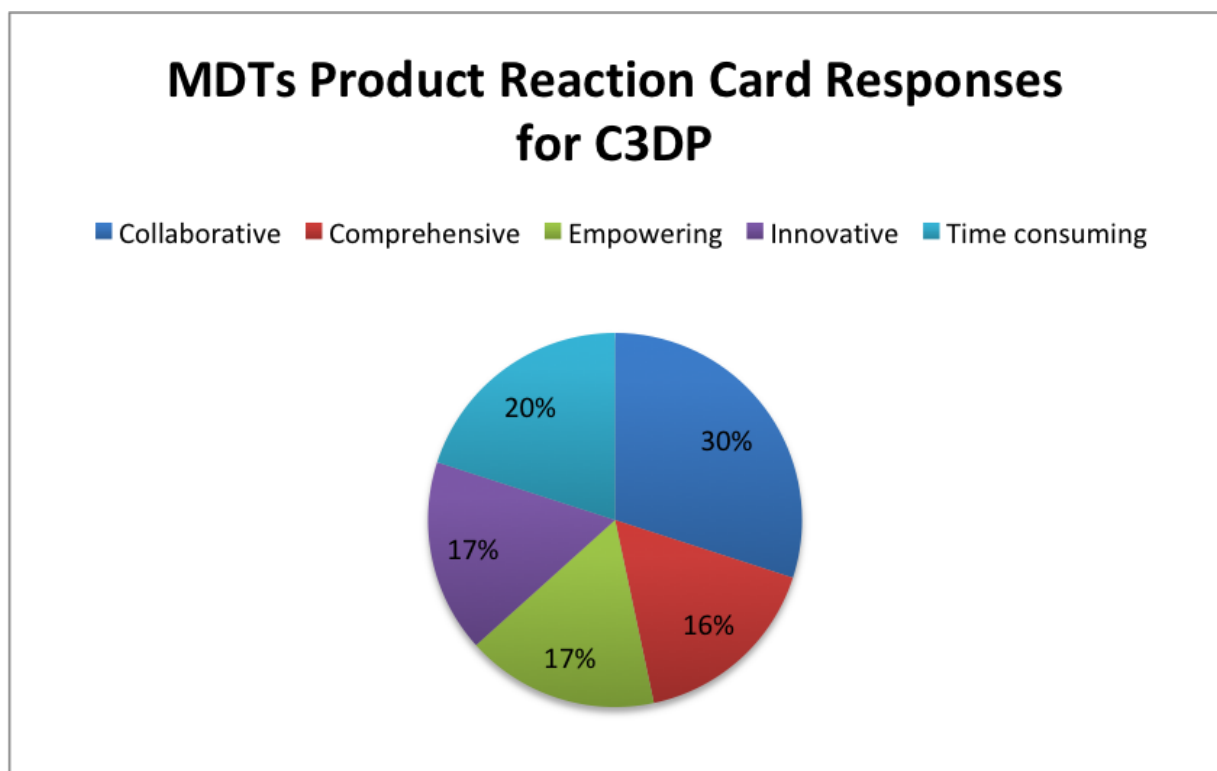


Figure 7: MDTs Product Reaction Card Responses for C3DP

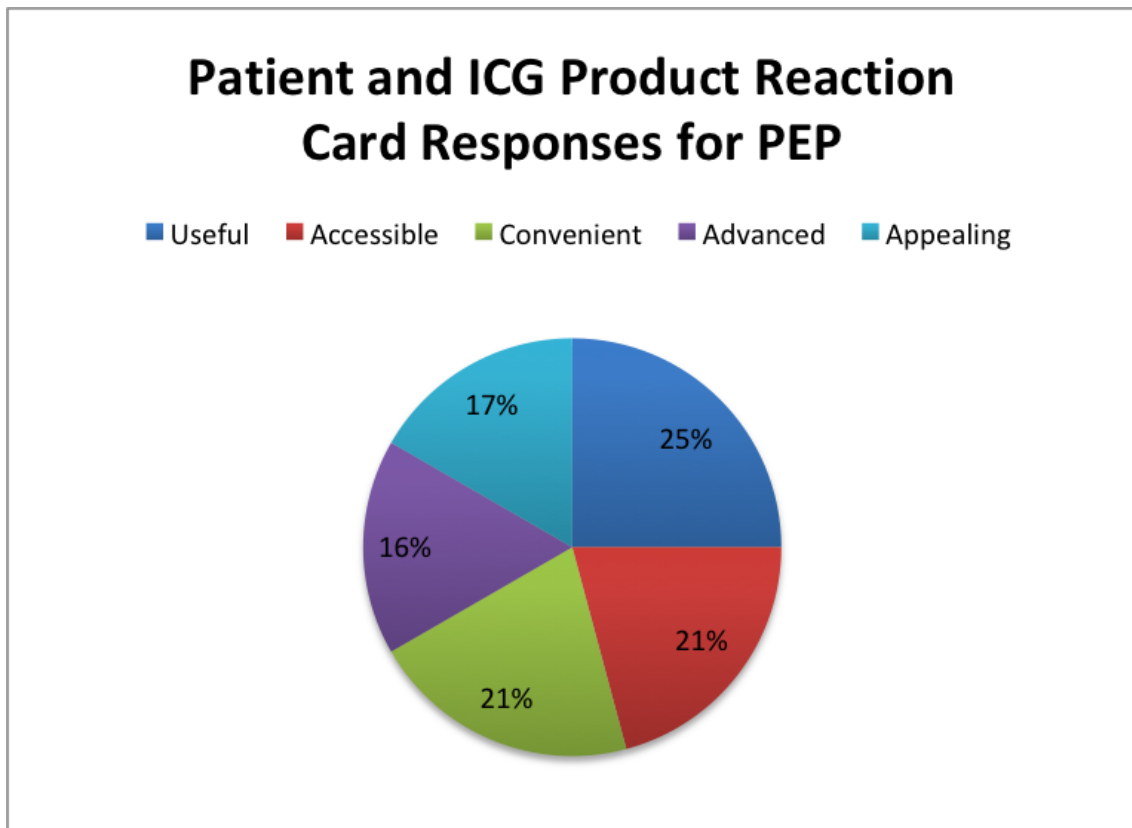


Figure 8: Patient and ICG Product Reaction Card Responses for PEP

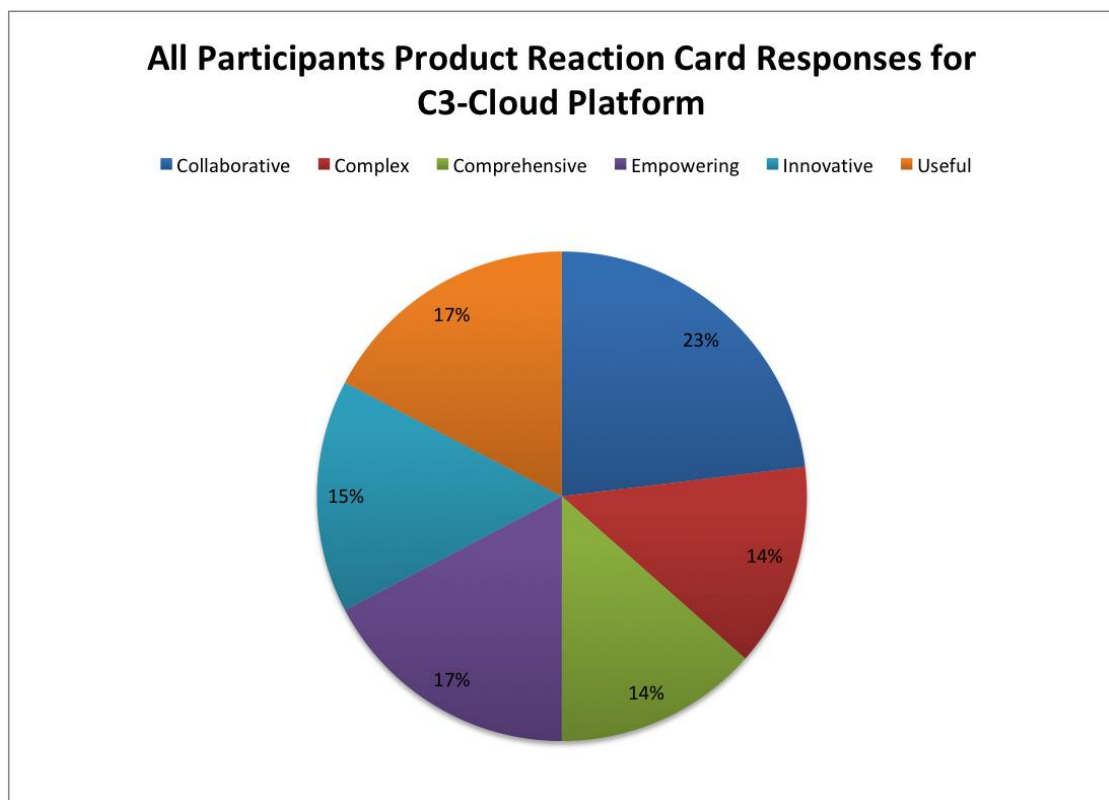


Figure 9: All Participants Product Reaction Card Responses for C3-Cloud Platform

4.3.1 Results

4.3.1.1 Usability of C3DP

Test users were asked to rate the C3DP software platform on 9 categories: *the overall reaction to the C3-Cloud system; the screen; the terminology and system information; learning; multimedia; tutorials; user manuals; system capabilities and software installation*. Each category comprises of one or more questions that could be rated from 0-9. For each category a summary figure presents the mean rating for each question (see **Figure 11** for an example). In addition, figures such as Figure 10 shows for each question: the mean, the standard deviation (STD), the distribution of ratings on a bar chart and a pie chart. The bar-chart shows only responses that were obtained on the respective item, while the pie chart shows all user responses, including the percentage of non-responders per item (See the figure below for an example. Appendix 6 presents the full results). The bar-charts and pie-charts are colour coded orange for values from 0-4 and green for values from 5-9. The total number of multidisciplinary team member responses considered for the C3DP usability testing is n=20.

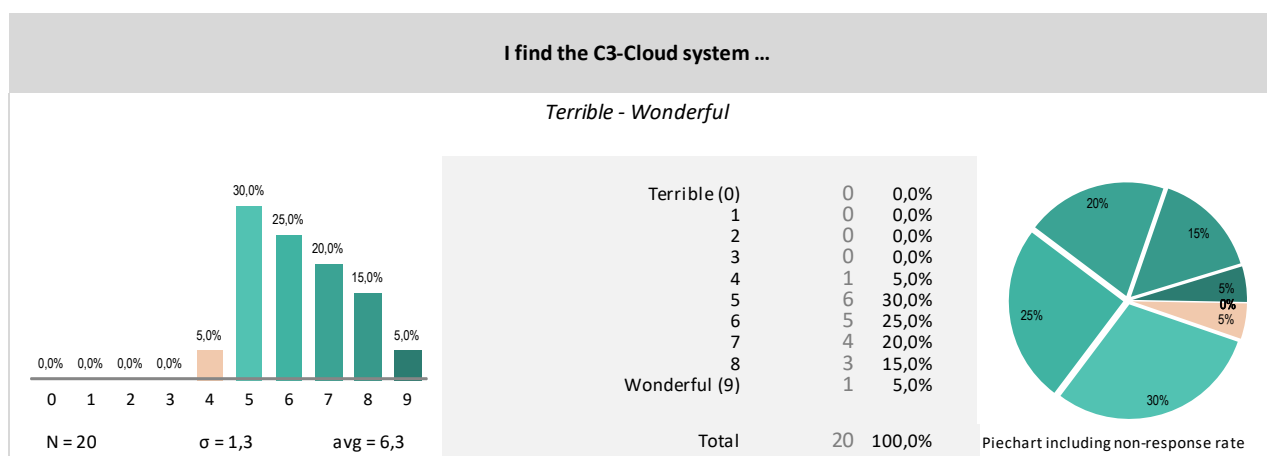


Figure 10 I find the system

Category 1: Overall reaction to the C3-Cloud system

Test users were asked for their overall reactions to the C3DP along six different impressions. **Figure 11** shows the mean ratings of 20 users to the impressions on a scale from 0-9.

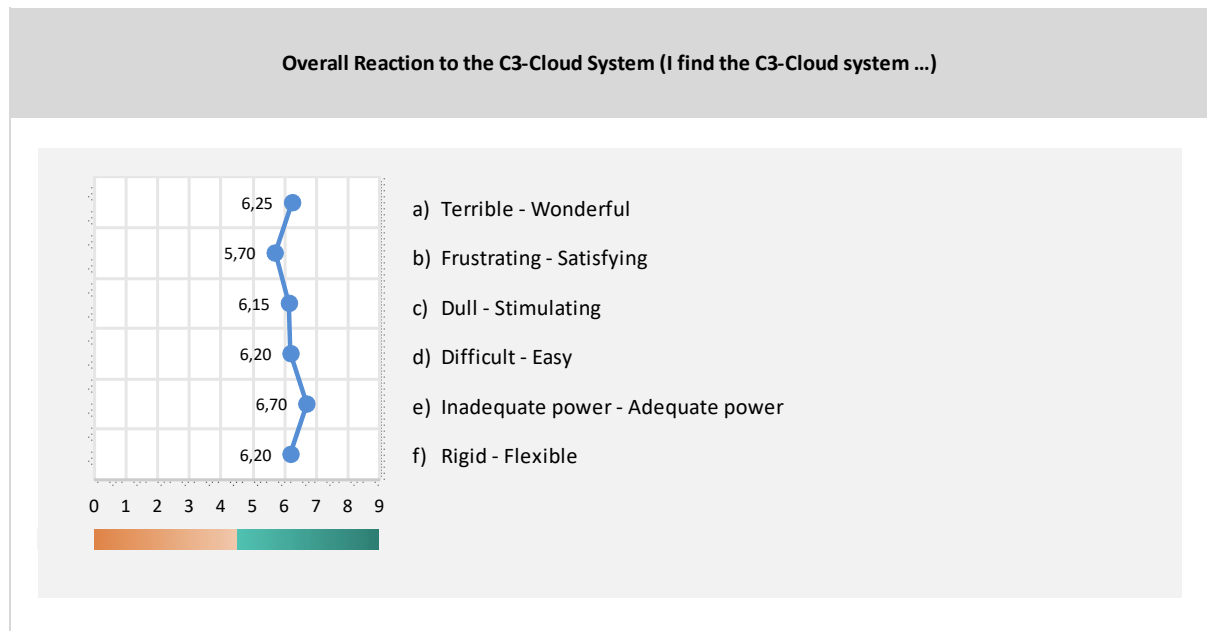


Figure 11: Overall Reaction to the C3-Cloud System (I find the C3-Cloud system ...)

Category 2: The screen

In this category test users were asked to rate different screen features of C3DP. Figure 12 shows the averages responses of 20 users to the screen features on a scale from 0-9.

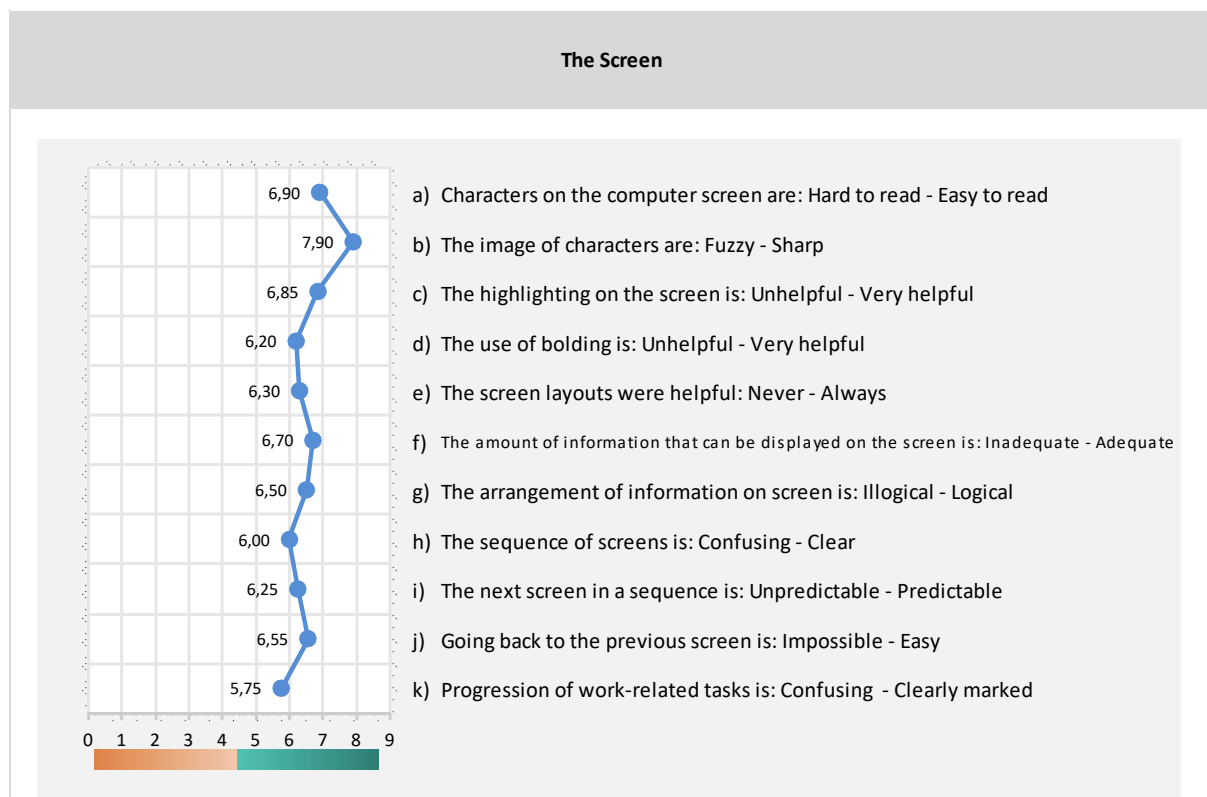


Figure 12: The Screen

Category 3: Terminology and system information

In this part test users were asked to rate different “Terminology and System Information” features of C3DP. Figure 13 shows the mean ratings of 20 users on a scale from 0-9.



Figure 13: Terminology and System Information

Category 4: Learning

In this category test users were asked to rate different “Learning” features of C3DP. Figure 14 shows the mean responses of 20 users on a scale from 0-9.

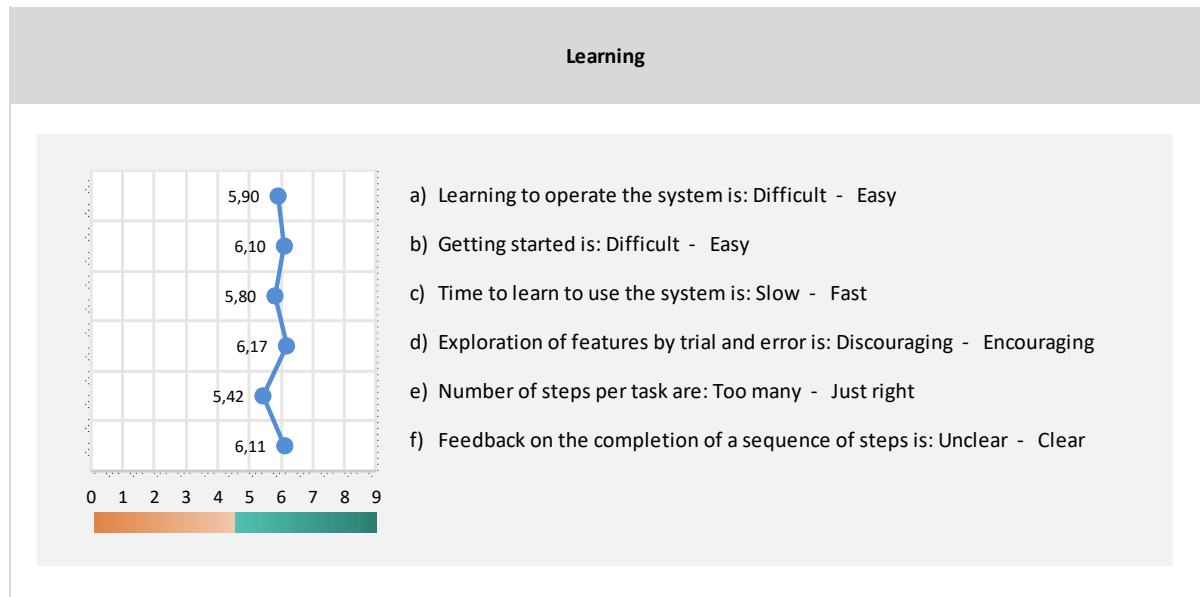


Figure 14: Learning

Category 5: Multimedia

In this part test users were asked to rate different multimedia features of C3DP. Figure 15 shows the mean ratings of 20 users on a scale from 0-9. Since no specific designated videos were shown or sound output was used during the test sessions, it is anticipated that the rather bad ratings on movies (d-f) and sound (g-h) could be based on test participants not being able to relate the QUIS item to a functionality of the software. This was also given as unstructured feedback by a few test participants.

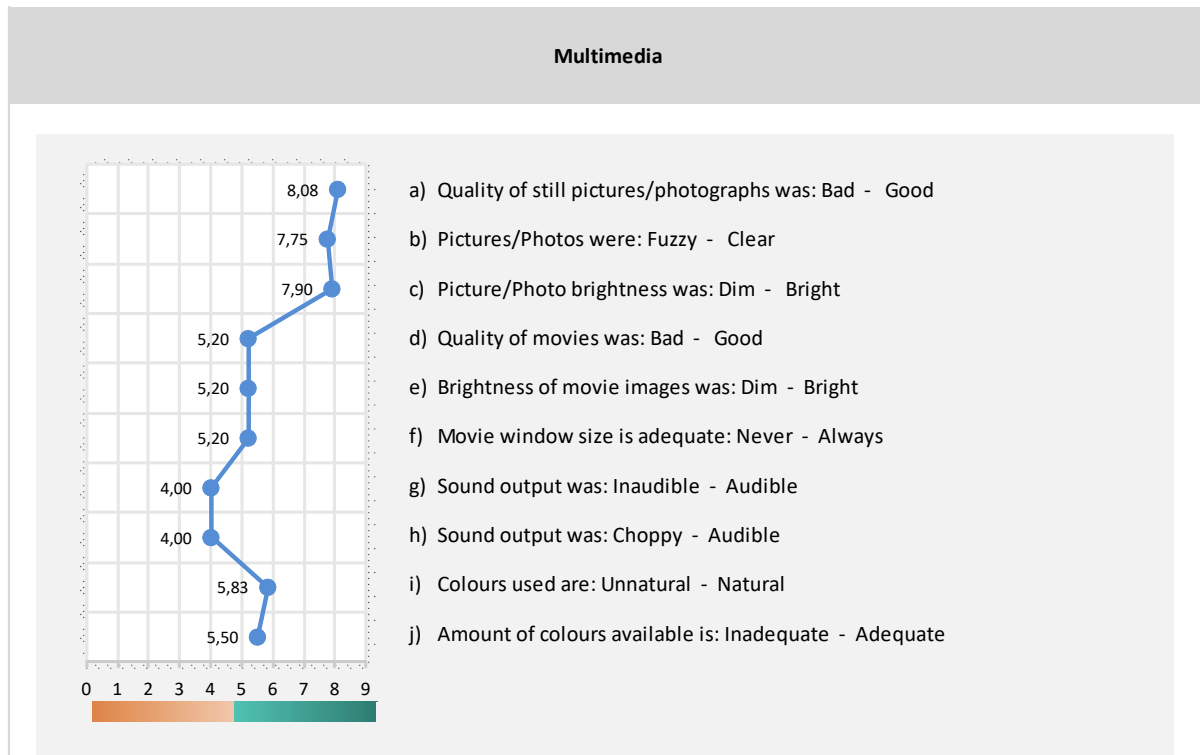


Figure 15: Multimedia

Category 6: Tutorials

In this category users were asked to rate “Tutorial”-question. Figure 16 shows the mean responses of 20 users to this feature on a scale from 0-9.

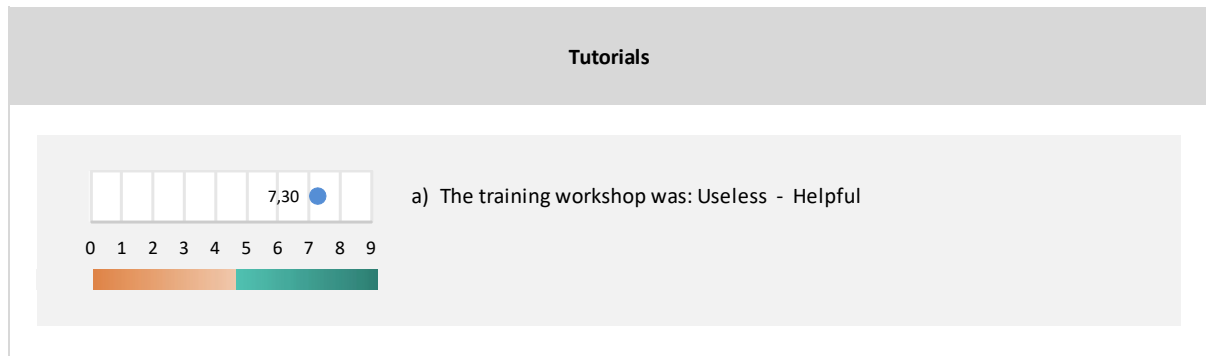


Figure 16: Tutorials

Category 7: User manual

In this category users were asked to rate six questions on the C3DP “User Manual”. Figure 17 shows the mean responses of 20 users on a scale from 0-9.

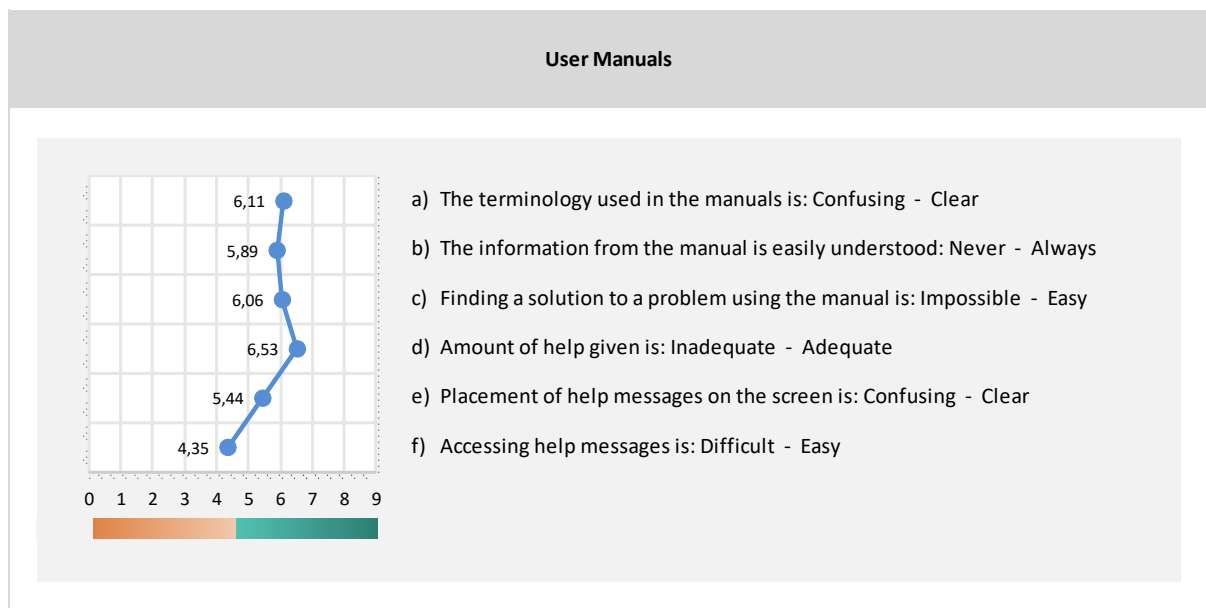


Figure 17: User Manuals

Category 8: System capabilities

In this category users were asked to rate different “System Capabilities” of the C3DP. Figure 18 displays the mean responses of 20 users on a scale from 0-9.

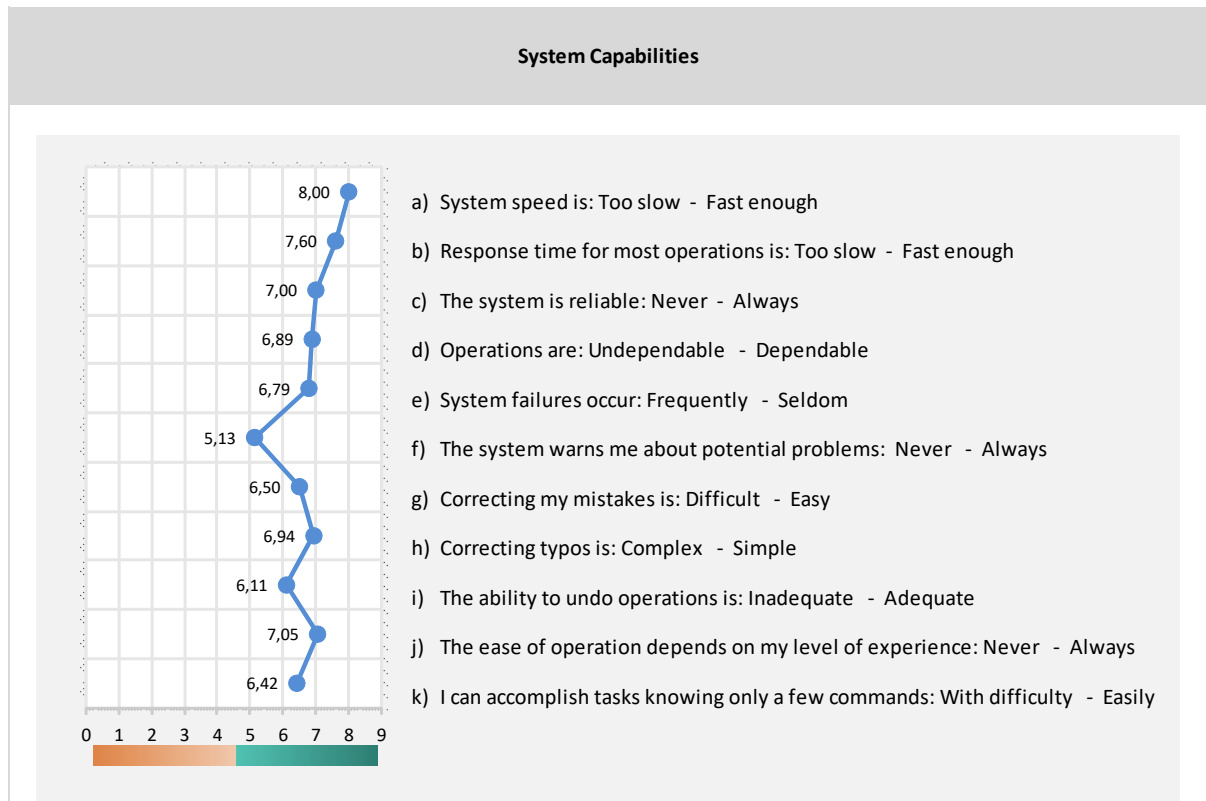


Figure 18: System Capabilities

Category 9: Software installation

In this category users were asked to rate the “Software Installation” of C3DP. Figure 19 shows the mean responses of 20 users on a scale from 0-9.

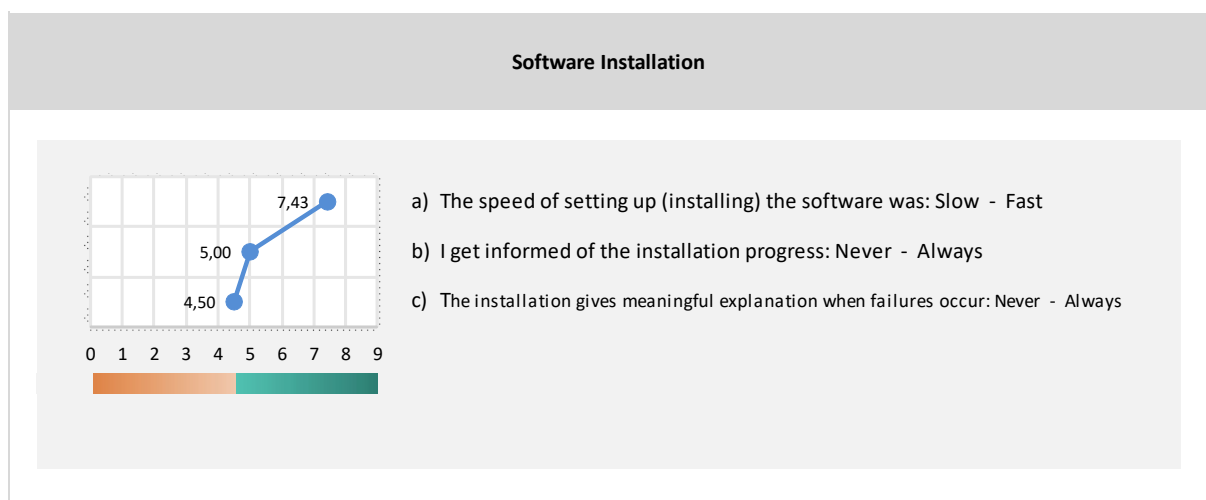


Figure 19: Software Installation

4.3.1.2 Usability of PEP

Test users were asked to rate the PEP software platform on 8 categories: *the overall reaction to the C3-Cloud system; the screen; the terminology and system information; learning; multimedia; tutorials; user manuals and system capabilities*. Each category comprises one or more questions that could be rated from 0-9. For each category a summary figure presents the mean rating for each question (see Figure 21). In addition, figures, such as in Figure 20, present for each question: the mean, the standard deviation (STD), the distribution of ratings on a bar chart and a pie chart. Appendix 6 reports all the figures for each category. The bar-chart shows only responses that were obtained on the respective item, while the pie chart shows all user responses, including the percentage of non-responders per item (see the figure below for an example). The bar-charts and pie-charts are colour coded orange for values from 0-4 and green for values from 5-9. The total number of patient responses considered for the PEP usability testing is n=26.

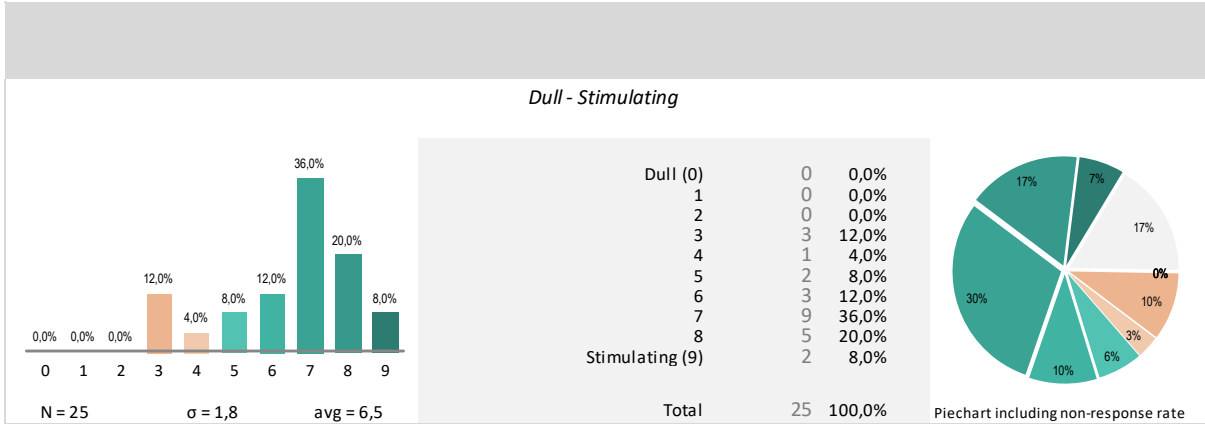


Figure 20: I find the C3-Cloud system (dull-stimulating)

Category 1: Overall reaction to the C3-Cloud system

Test users were asked for their overall reactions to the PEP along six different impressions. Figure 21 shows the mean ratings of 25 users to the impressions on a scale from 0-9.

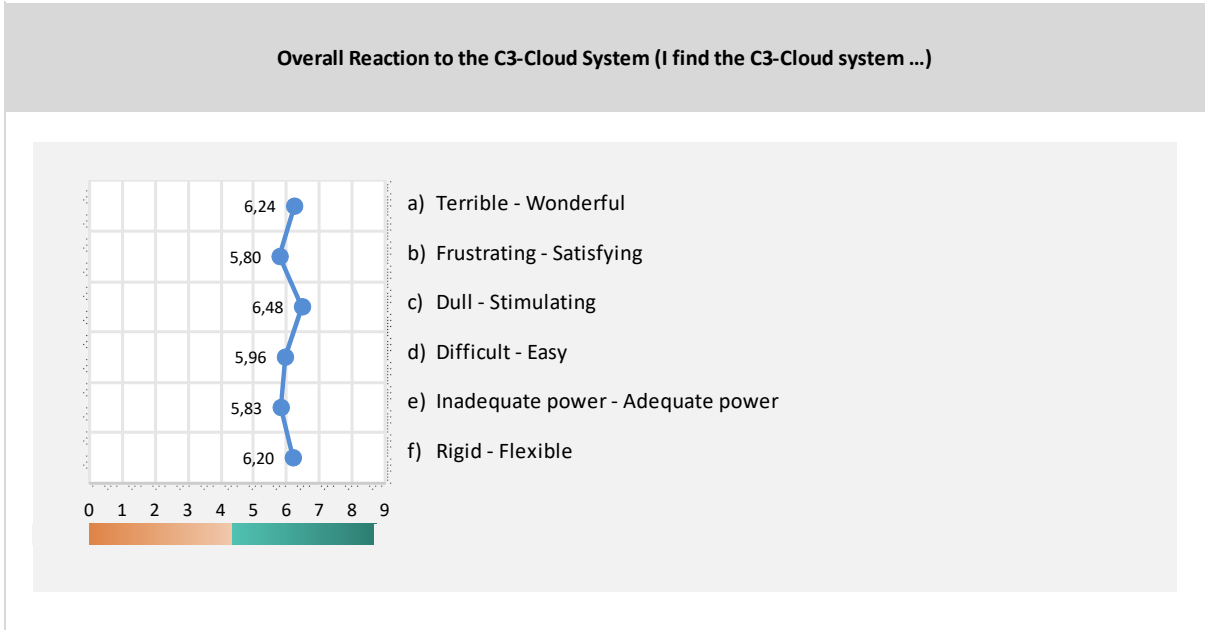


Figure 21: Overall Reaction to the C3-Cloud System (I find the C3-Cloud system ...)

Category 2: The screen

In this category users were asked to rate different screen features of PEP. Figure 22 shows the average responses to the screen features on a scale from 0-9.

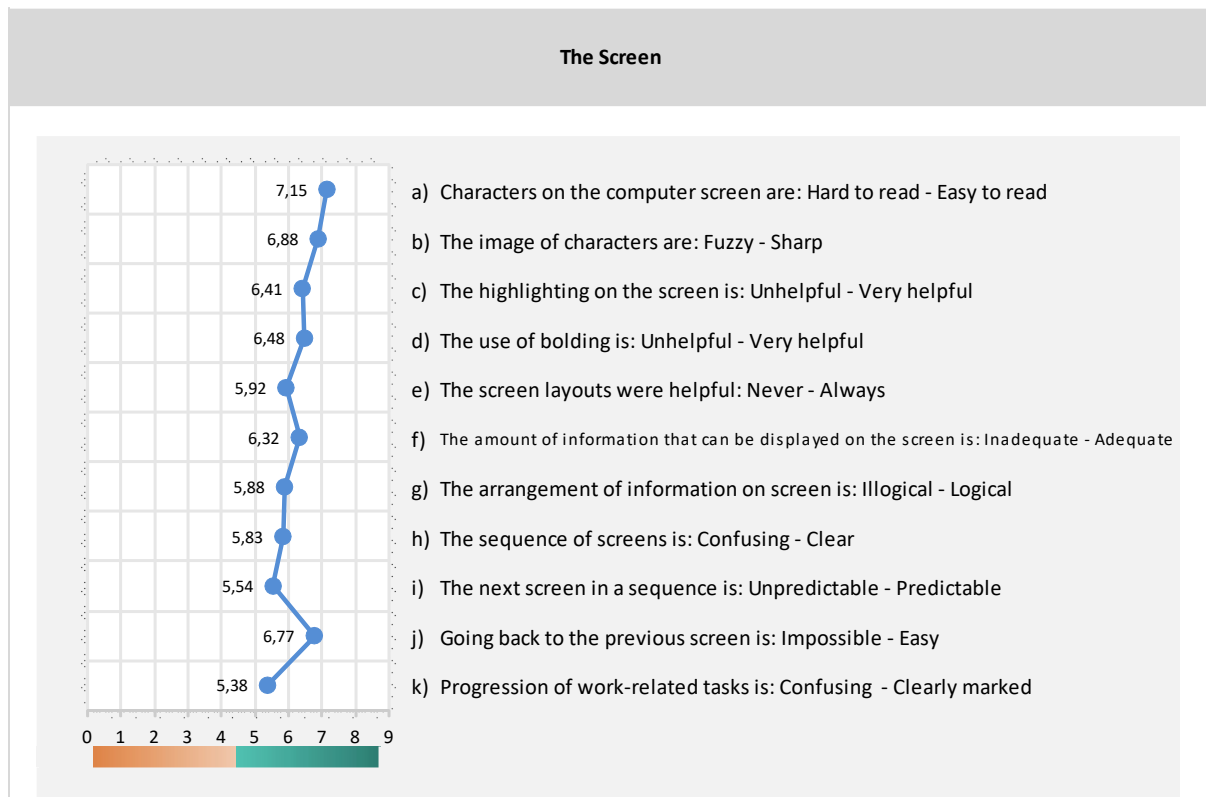


Figure 22: The Screen

Category 3: Terminology and system information

In this part test users were asked to rate different “Terminology and System Information” features of PEP. Figure 23 shows the mean ratings of 25 users on a scale from 0-9.



Figure 23: Terminology and System Information

Category 4: Learning

In this category users were asked to rate different “Learning” features of PEP. Figure 24 shows the mean responses of 25 users on a scale from 0-9.

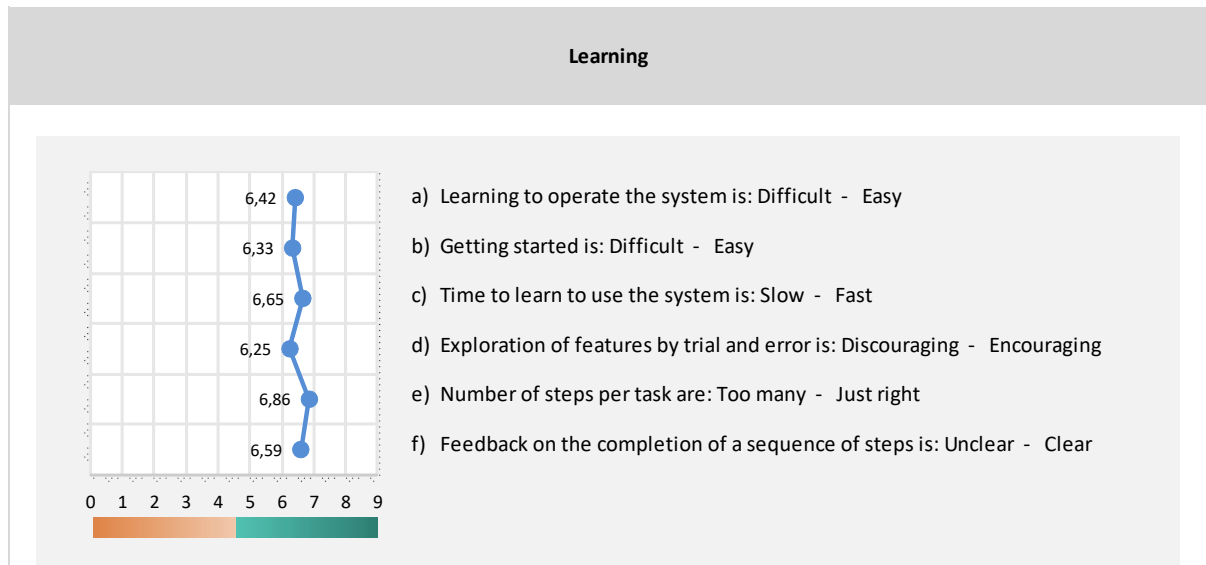


Figure 24: Learning

Category 5: Multimedia

In this part users were asked to rate different multimedia features of the PEP. Figure 25 shows the mean ratings on a scale from 0-9..

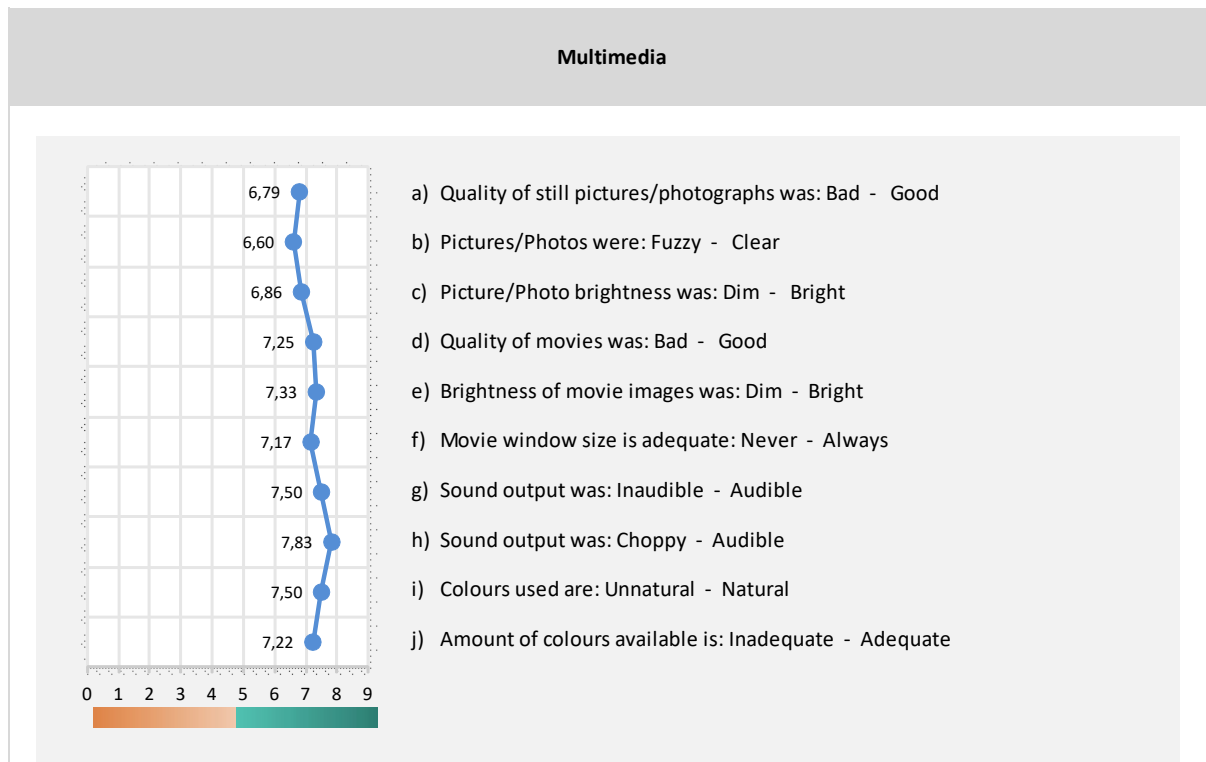


Figure 25: Multimedia

Category 6: Tutorials

In this category users were asked to rate a question about the PEP-“Tutorial”. Figure 26 shows the mean rating of 23 users to this feature on a scale from 0-9. Additional questions on this category will be asked during the actual technology trial later in the project.

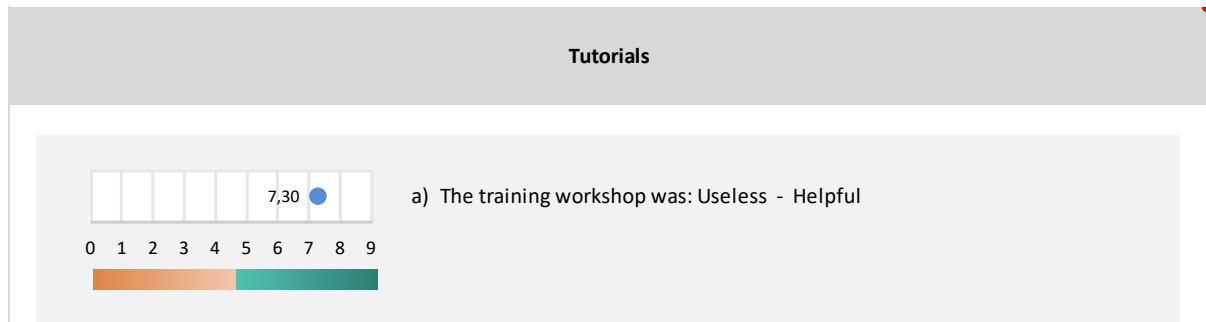


Figure 26: Tutorials

Category 7: User Manual

In this category users were asked to rate six questions on the PEP “User Manual”. Figure 27 shows the mean responses on a scale from 0-9.

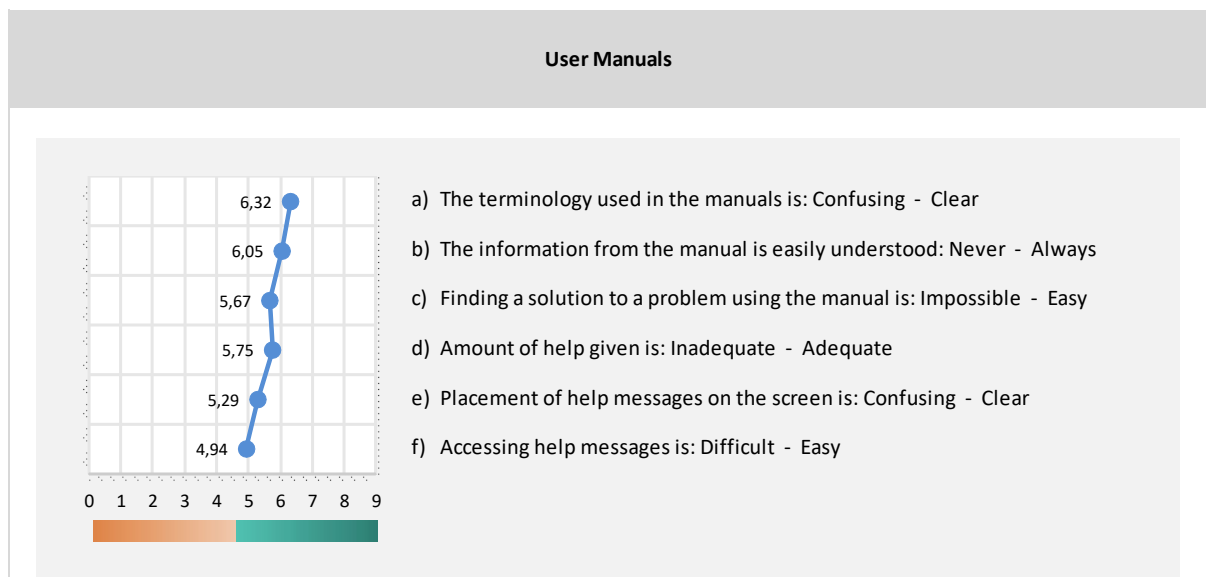


Figure 27: User Manuals

Category 8: System capabilities

In this category users were asked to rate different “System Capabilities” of the PEP. Figure 28 displays the mean responses of 25 users on a scale from 0-9.

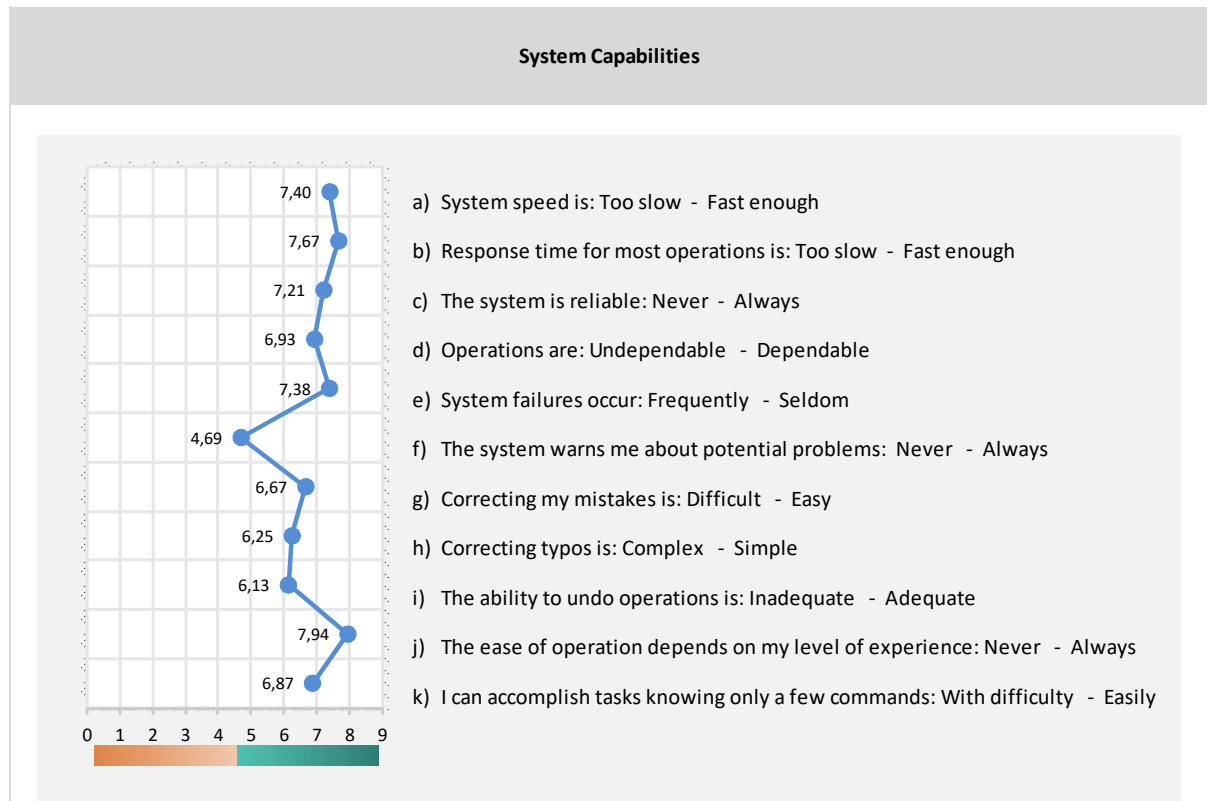


Figure 28: System Capabilities

4.4 Unstructured feedback summary

4.4.1 Method

This chapter summarizes general feedback received from MDT members on the C3DP and from patients on the PEP during the May 2018 test sessions as part of Task 9.2 at the SWFT, BC and RJH pilot sites. During the test sessions pilot site managers who moderated the sessions recorded feedback from the users. The feedback is reported below separately for the C3DP and the PEP. Feedback from the different pilot sites complement each other. There is general feedback on the platform and specific feedback on specific functionalities or flaws that were experienced. If feedback was raised more than once, it is reported here only once. Where it is useful or needed, the feedback is supported with screenshots.

4.4.2 Results

4.4.2.1 C3DP general feedback

1. Testers were generally very positive about the C3-Cloud concept and experienced it as very promising, helpful and easy to use.
2. Testers liked how it was very clinically focused.
3. The fact that C3DP suggests goals and activities was experienced as being very positive and helpful.
4. Testers would not want to use two or more IT systems in parallel. They prefer to see the functionality incorporated into their existing systems.

5. Super user support was needed to complete the testing as there were too many uncertainties.
6. Testers felt that systems need to be more user-friendly and intuitive before it would be accepted by clinicians during the technology trial and certainly as part of routine practice. Currently, the sequence of steps in the user interface is not always clear and there are uncertainties as to what the next step is. However, “simple tasks or activities” were experienced as intuitive.
7. The C3DP crashed once and the tester could not find a safe way of closing the system. It is encouraged to implement a safe way of closing the system if it crashes or freezes.
8. One user experienced that only half of the screen was displayed and the other half was cut off.
9. When one user logged off the C3DP a message similar to “Trying to retrieve information” was displayed, but the user could not find a safe close button and thus had to quit the connection.
10. The application testing and usability testing questionnaires were too long and did not allow the issues that testers encountered to be clearly defined. Testers felt that it would have been more efficient to integrate the questions into the walkthrough document so that they could answer the questions as they were testing the relevant sections on the C3-Cloud platforms. Furthermore, there was an issue for some test users that the platforms were not in their native language, despite having language facilitators readily available.
11. Regarding the information available on the platform: All users should be informed before using the platforms what information they can expect to find and where it can be found on the platform.

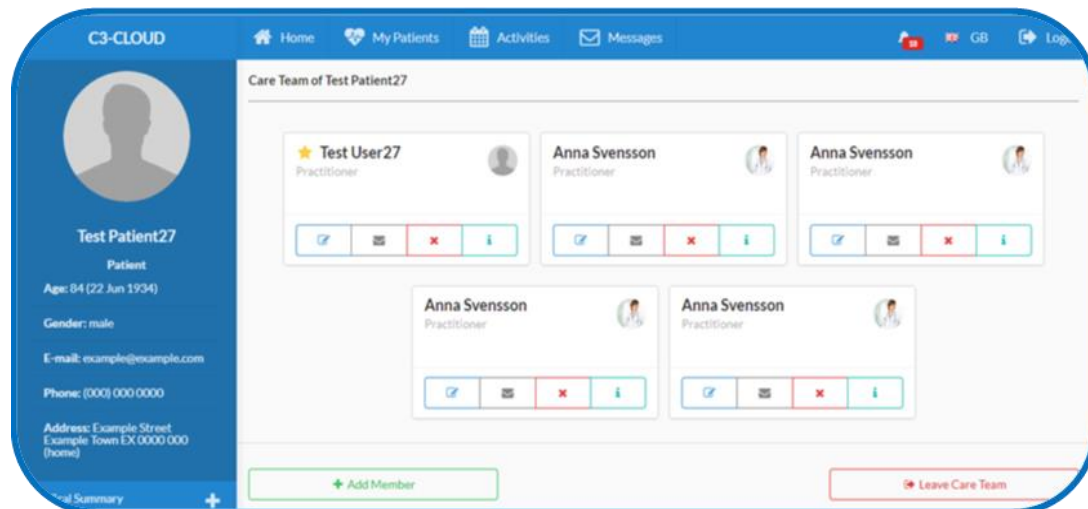
4.4.2.2 C3DP specific feedback

Feedback regarding usability:

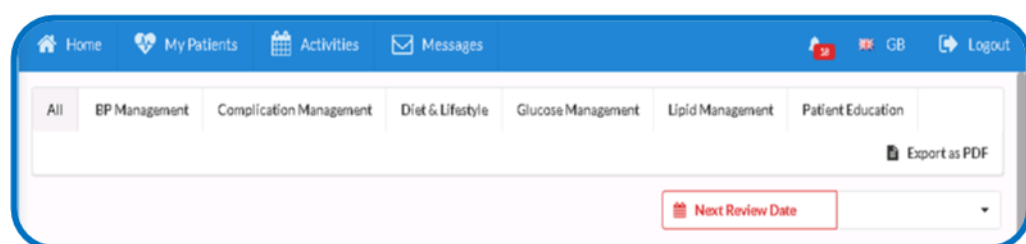
1. Testers found the method of initially adding and managing care team members very complicated. This needs to be presented in a more user-friendly way. Taking into account the complexity of the primary care staff databases, it is suggested to first select first the role and then select the name of the care team member.
2. It is also unclear what the functionality of ‘Assign Existing Care Team’ is.

The screenshot displays a user interface for managing a patient's care team. On the left, a blue sidebar contains patient details for 'Test Patient11', including age, gender, contact information, and address. The main area is titled 'Care Team' and includes options to 'Assign existing care team', 'Create New Care Team', and 'Add New Member'. A search bar is present for finding members. A table lists 'Test User27, Practitioner' with a role dropdown set to 'General physician'. To the right of the table are toggle switches for 'Manager' (checked) and 'Set as manager', along with a red 'Remove' button.

3. During the testing there were different visual presentations of the care team. Testers preferred the view below and wondered if this view can be utilized to set up and manage the care team instead of the option presented during the testing.
4. The ‘Leave Care Team’ button below is confusing – it should be clarified that this button *deletes* a member of the team. Some of the testers thought that its functionality is only to exit from the current screen.



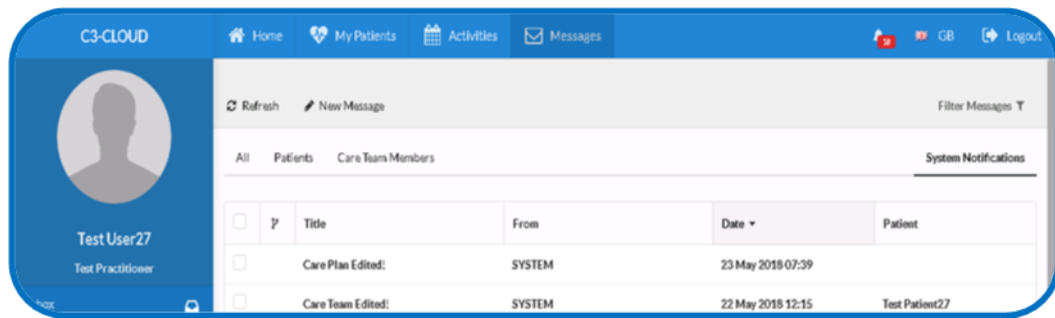
5. Updating care team members or authorizing a new care team member was not possible during the test session.
6. Users find it unclear why the roles of MDT members must be entered manually when setting up the new care team. The role should already be defined in the account settings when the MDT member receives access to the C3DP.
7. What happens with scheduled appointments if the respective care team member leaves the organization? E.g. transfer of the appointment to a different / new team member or cancellation of the appointment?
8. The link of a meal photo could not be left-clicked on after it had been added from the PEP. Testers had to right click on the link and open it in a new explorer tab.
9. The questionnaire on “medication side effects” did not save in PEP and was therefore not showing in the C3DP.
10. There were different, confusing criteria for medications. E.g. drugs that could cause hypoglycemia and metformin were listed on different sets.
11. Testers struggled to understand the use of the high-level goals on the care plan page (see below). It is not obvious that they have to select the appropriate tab before creating goals and activities. They need to be prompted to select a tab before they create a goal or an activity.



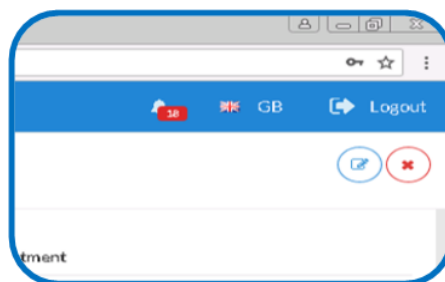
12. On the care plan view “Glucose Management”: When there is a lot of content shown under the heading “patient data” using the mouse wheel to scroll down to the next heading is not easily possible. It will first scroll through all entries under the heading “Patient Data”, then scrolling will be ineffective for a short time and only after that it is possible to fully scroll down the screen. This finding was not easily reproducible but happens more often when the testers wanted to quickly scroll down to other headings (skipping the “Patient Data” heading”).
13. The “Save” button on the “Chronic Disease Profile” was not easy to find. Data entries were sometimes lost as users thought it would be automatically saved (in the perceived absence of a “Save”-button)

The screenshot displays the C3-Cloud web application interface. On the left, a sidebar contains a patient profile for AMAJUR PIRES ALVAREZ, including age (27), gender (female), and contact information. The main area shows various medical data entry fields: Weight, Height, BMI, Social History (Smoking status, Alcohol intake), Family History (Heart attack, Angina), and Risks (Frailty score, QRISK2). A yellow box highlights a 'Save' button in the bottom right corner of the main content area.

14. It was not possible to select 'Pilates' material in the guidance.
15. 'Further Suggestions' and 'Education Materials' in the care plan sometimes do not display any content. This is indicated by greyed-out centric text. The text should be left-bound – as is all other text and should be more readable, i.e. blacker.
16. 'Further Suggestions' box: Users thought they are supposed to add something here rather than just receiving additional suggestions for their reference.
17. Users were unclear if 'Further Suggestions' would also suggest goals or activities. If that were the case, then the users suggested including them in the specific sections of goals and activities to be shown to the professionals as suggested in goals/activities from the CDS. The suggestions can be very helpful for more complex patients and could be easily overseen if they are in other section. Users said that a clinician could miss crucial information if he/she does not know that it is available.
18. Where dates should be entered, the default value should be the current day's date.
19. If repeated monthly appointments are set up, the system does not recognise weekend days when scheduling. Therefore, it is possible to accidentally schedule appointments for non-working days.
20. Treatment follow-up activities need to display whom the follow-up is planned for.
21. Testers were unclear how they would see notifications for new activities, photos, questionnaire completion or other items, which may have been submitted by patients.
22. 'System Notifications' tab under 'messages' should be next to 'All', 'Patients' and 'Care Team Members' and not on the right side (see below). In addition, these items should look like tabs that can be clicked on. Otherwise, one cannot know that clicking the text filters the messages. Likewise, 'Filter Messages' should also be on the left. Testers found the options in this section a bit confusing.
23. The alarm bell at the top right of the screen is not the best way of notifying users of new messages. It could be beneficial to distinguish between message notifications and system notifications. For message notifications it would be better to have number in brackets next to 'messages' (see below).
24. The system notifications should provide a functionality to filter for notifications that relate to only the current active (selected) patient.

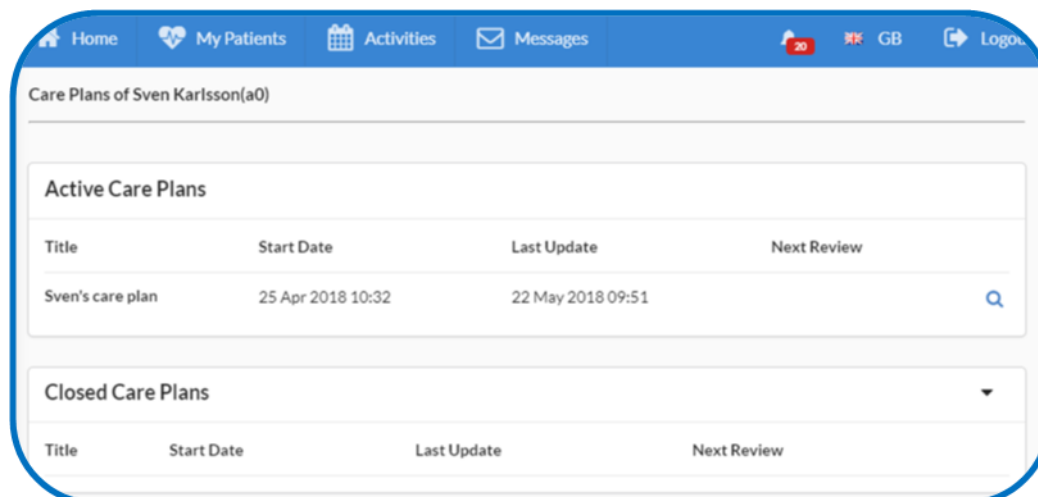


25. Testers wondered if a reminder is sent to the healthcare professional and / or the patient in case of a scheduled appointment has been missed?
26. Issues were experienced as to appointment duplication with some patients – all having the same date. It should be clarified if this is just an issue in the test session or not.
27. Is it possible to see if patients have opened / read assigned training materials.
28. Testers missed a 'help' icon or general 'search' function.
29. Testers missed a link to the 'training manual' in the system as a resource in case they needed support.
30. It was not possible for a professional to use the search function to find a patient who was under the care of another professional and who already was logged in and reviewing the patient. An error message should indicate this.
31. The list of 'My Patients' should be available as both: the card format and a list format. Testers said that the card-view can get very lengthy as the number of patients increase
32. To see a photo uploaded from the PEP one needs to refresh the C3DP. The new item is not pushed to the C3DP automatically!
33. Some users wondered how a new patient would be added to the platform.
34. When you open charts (e.g. the BMI progress chart), there is no 'x' to close the chart. Some users did not realise they had to click on the system background to close the chart.
35. When a chart is open, the '3-bars button' for further options offers different file format options. It was unclear why the different options were offered. Instead, maybe offer a functionality to 'download' the chart?
36. "Medical Summary Page" and "Chronic Disease Profile" screens seem to contain duplicated content and look very much alike. The difference between both is unclear and users were not sure if both are needed in the final C3DP version.
37. 'Save' and 'Cancel' boxes are very small when goals or activities are opened. They could be more obvious and at the bottom of the window (see below).

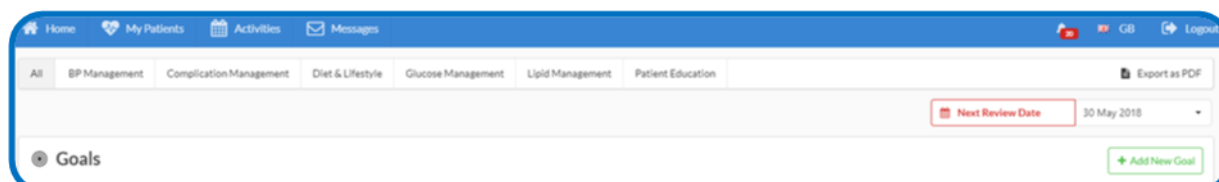


38. It is unclear if the search function for training materials only searches for the first word in the search box. It needs to be able to search on any word that is typed in the search box.
39. When you click on the 'Chronic Disease Profile' tab, the page heading is 'Medical Summary Profile template for Type 2 Diabetes'. This is confusing.

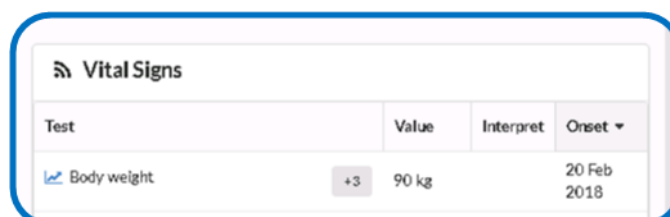
40. When clicking 'Care Plan' and 'Previous Care Plans' the sub-menu 'Care Plan' closes. This is confusing as it is not the case when clicking 'Care Plan' and 'Care Team'
41. When clicking 'Care Plan' and 'Previous Care Plans': First thing shown is 'Active Care Plans' and only below are 'Closed Care Plans' which is confusing. The sub-categories in the 'Active' and 'Closed' care plans (e.g. Title / Start Date / Last Update / Next Review) are not aligned vertically (see below).



42. It is not clear how a care plan can be 'closed'.
43. The button "Next Review Date" has no apparent function but the mouse icon changes on mouse-over. It should also be explicit that this refers to the next review date *of the care plan*. The word 'Next' may be deleted in the button'. The button could also be on the left side instead of the right side (see below).

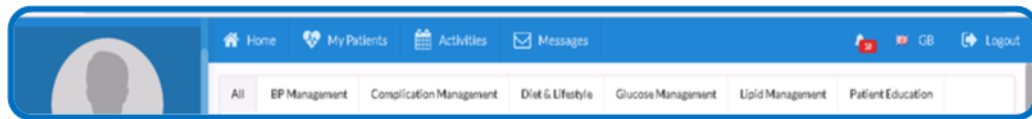


44. Where previous readings are available, e.g. 'vital signs', the last reading should be visible with an option to click the previous ones. It should not just be a number in a box (see below).



45. 'Add New Goal' and 'Add New Activity'-buttons on the care plan could be on the left side instead of the right side.
46. Screens should be as minimalistic as possible. Testers wondered if it is necessary to repeat menus at the left sidebar and at the top? E.g. "Home / My Patients / Activities / Messages".
47. Testers were confused when the left sidebar menu suddenly changed when switching to "Messages". They did not know how to get back to the previous sidebar menu.

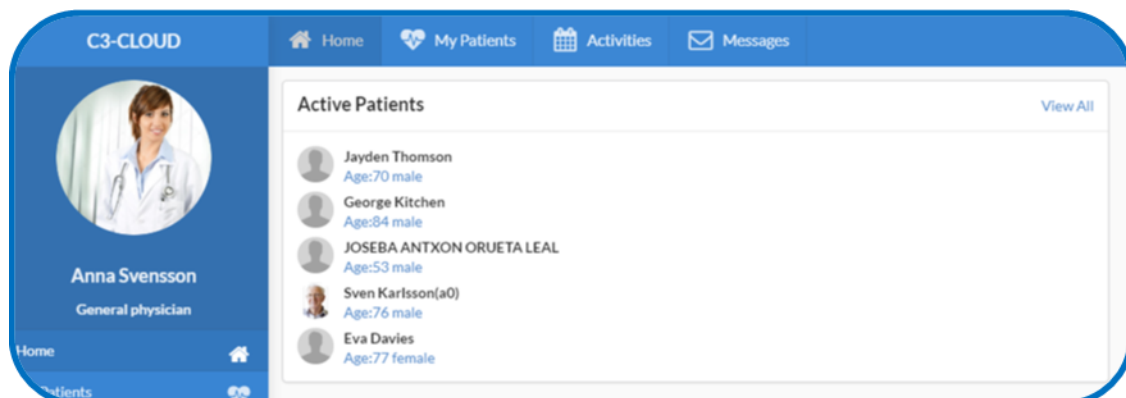
48. The high-level goals in the Care Plan view should be fixed on the top screen and not disappear when scrolling down – should always be visible wherever you are in the screen (see below).



49. The 'Medical Summary' screen contains a lot of data in each of the sections. A simplification should be considered.
50. Testers missed a key for the symbols of goals, activities and education. The symbols used were not always clear (see below).



51. On the 'Chronic Disease Profile' screen: It is not clear why the user has to check (or can check) the medication again, since it is expected that the C3DP has already extracted that information from the local systems onto the medical summary screen. If the aim is for the Clinical Decision Support to launch recommendations on drug-drug or drug-disease interactions, this should be done automatically without the need to manually tick this off again. In the case of Osakidetza an authorized healthcare professional adds a new drug into Osabide Global, then refreshes the C3DP 'Medical Summary' screen and finally needs to check out this new drug on the Chronic Illness Profile screen. This adds too many steps and raises concerns about false entries.
52. The 'Active Patients' on the 'Home'-screen should be highlighted when hovering or on mouse-over. This would make it clearer where to click when the user wants to select a specific patient (see below).



53. It is suggested to highlight the current active Care plan tab in the left menu-bar more. Currently, it is difficult to differ between the light and the slightly darker blue highlighting.
54. When adding an activity or medication request: Users suggest adding a glossary or explanatory pop-up on mouse over for the different 'Status'-options. Otherwise it is difficult to select the appropriate option.
55. There is an information overload in some pages, e.g. the clinical summary page. As BC suggests this could be simplified and with an option to expand the information within certain areas if required.

56. Text is sometimes grey or shaded. This suggests a non-active link while it was not the case in C3DP.
57. The “All” tab in the care plan and the specified high-level goals do not always give the same information. It was not clear if this is a data inconsistency.
58. Current status of Clinical Decision Support: Users changed the Blood Pressure data of a patient, yet the C3DP did not adjust the suggested drug treatment. Users were thus unclear if this is a bug or was due to using an early version of the final product.

Feedback regarding care plan goals:

59. When adding a new goal, the goal detail box (‘create another goal’) should automatically open for completion. Currently, adding a new goal opens a list and there is no prompt to add further information. Instead the user has to click on ‘Create another Goal’ to add further information.
60. List of goals/activities: It would help if the care plan goals and activities could be grouped by category. This would allow a professional to expand currently relevant goals or activities.
61. The ‘Medications’-list under the high-level goal ‘BP management’ does not update when a drug is prescribed. If for example, calcium channel blockers are prescribed the ‘Medications’ on the HL-goal ‘BP Management’ should automatically change the item ‘Calcium Channel Blockers’ to ‘Yes’. Otherwise this will lead to an extra process (see below).

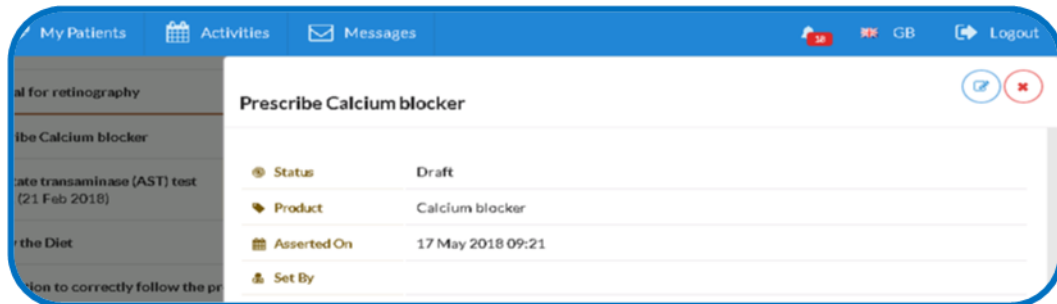
The screenshot displays the C3-Cloud interface for a patient named Sven Karlsson. The left sidebar shows patient details: Sven Karlsson (a0), Patient, Age: 76 (16 Aug 1942), Gender: male, E-mail: svenkarlsson@example.com, Phone: (360) 555 1212, and Address: Solldamsgatan 29, Östersund 831 43 (home). The main content area has tabs for All, BP Management, Complication Management, Diet & Lifestyle, Glucose Management, Lipid Management, Patient Education, and Export as PDF. The 'BP Management' tab is active, showing a 'Next Review Date' field. Below this, the 'Patient Data' section is divided into four columns: Conditions, Medications, Lab Results, and Vital Signs. The 'Conditions' column lists Type 2 diabetes, Hypertension, Micro-vascular, and Cardiovascular disease, each with radio buttons for Yes, No, and Unknown. The 'Medications' column lists Diuretics, Calcium Channel Blockers, Agents Acting on the Renin-Angiotensin System, ACE Inhibitors, and Angiotensin II antagonists, each with radio buttons for Yes, No, and Unknown. The 'Lab Results' column shows Albumin secretion with a quantity field and a unit dropdown (mg/l). The 'Vital Signs' column shows Systolic and Diastolic blood pressure with input fields and unit dropdowns (mmHg). A 'Save' button is located at the bottom right of the form.

62. ‘Adding a goal with a target value’: When setting a metabolic control goal by selecting the goal that the system offers (e.g. HbA1C), the MDT member cannot see the target value unless he/she edits the goal again or sets a new target value.
63. Communication between the tab ‘All’ and the other ‘High level goals’ is confusing: When a new goal related to BP is created in the tab ‘All’ (for instance the goal ‘Keep blood pressure under control’) it is not shown in the high-level goal ‘BP management’ tab. The user expects that both tabs communicate with each other.

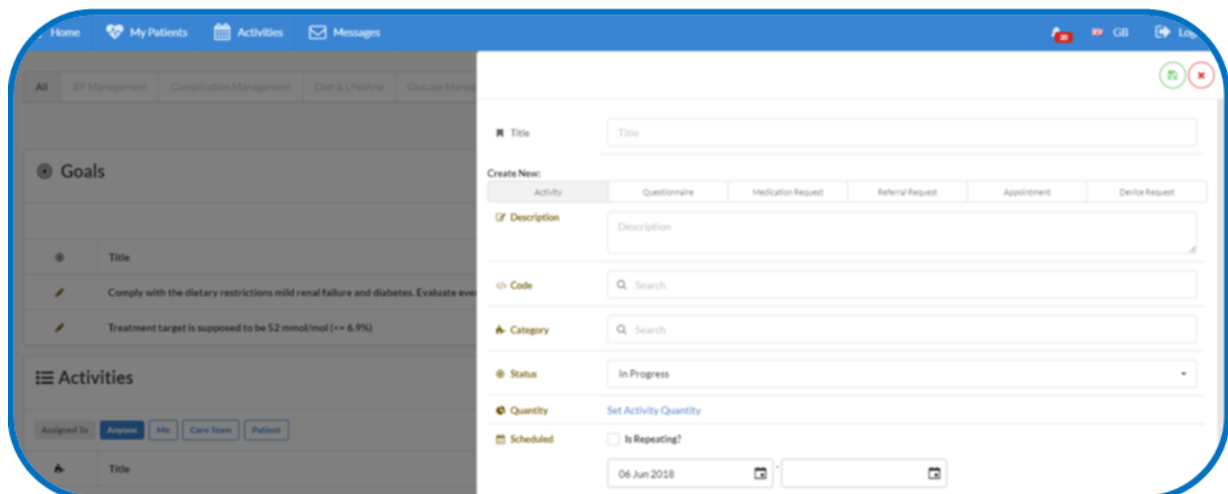
Feedback regarding care plan activities:

64. When a calcium channel blocker is prescribed, this was not shown in the medical summary.

65. If a drug is prescribed in activities, it is not shown in the medication list. The chronic disease profile also does not update with the drug that has been prescribed.
66. Users should not be able to select drugs which are outside of the selected drug group. If for example the group “calcium channel blocker” is selected, any drug can be selected also outside of the group of calcium channel blockers.
67. Medication prescriptions can easily be left as ‘draft’ (see below). Users should be made aware that it is necessary to change this to ‘complete’ or an alternative process should be defined.

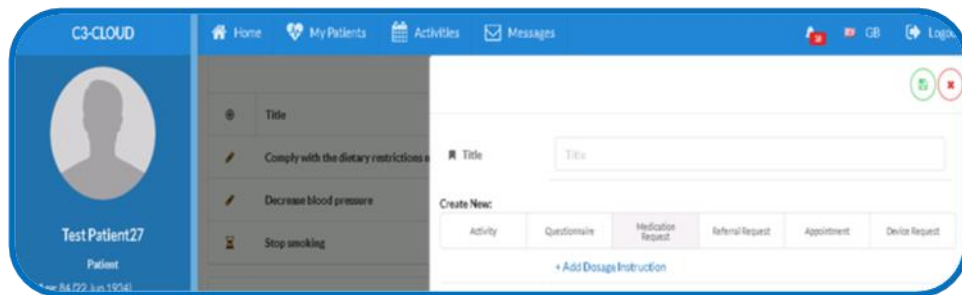


68. Editing an existing activity and saving the changes triggered an error message: “Activity couldn’t be updated”. However, the activity was updated on the Care plan.
69. When creating new activities, the mandatory questions, particularly who its assigned to etc, should be in the detail form. It is confusing to have to click on sub-links.
70. It should be impossible to assign activities to ‘Anyone’. Any activity needs to be assigned to a named individual. Otherwise there is a higher risk of it being overlooked.
71. When adding a new activity, the ‘Add Activity’-menu is shown. In that menu, the button to ‘Create Another Activity’ is greyed out. This gives the impression that it cannot be selected.
72. When adding a new activity “medication request” and a product was searched and selected already, users must click “change” and start searching from scratch instead of deleting some letters in the search box using the keyboard. This is not intuitive.
73. Users could benefit from being prompted automatically to complete activities after a new goal is created.
74. When adding a new activity the selection of a category should be mandatory.

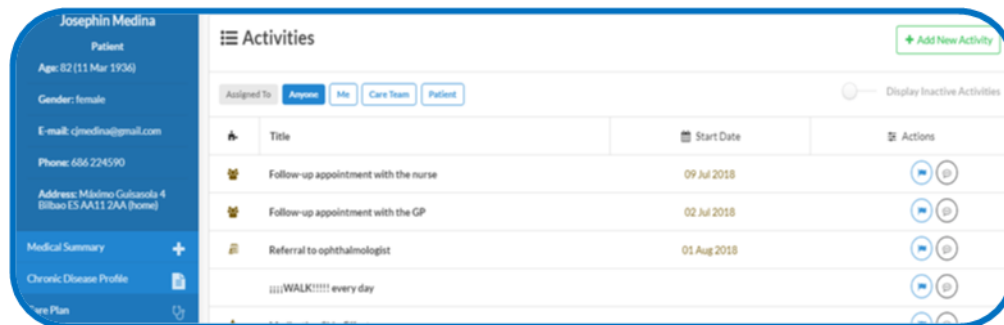


75. When adding a new activity: Consider changing the term ‘Performer’ to ‘Performed By’ or another suitable term.

76. When adding a 'Medication Request' activity, users should not need to click on links (e.g. '+Add Dosage Instruction' or '+Add Note') to show additional data entry options (see below).



77. When adding a new activity ('Device Request'): Searching for any 'BYOD' does not give any results. 'Select Device' has only one option. Where are additional options for devices defined?
78. When listing the activities: The function of the buttons 'Assigned To: Anyone / Me / Care Team / Patient' was confusing for some users. Instead of thinking of it as a filter, some users thought that clicking one of the buttons will assign 'performer status' of the previously created activity to the respective person group that was clicked (see below).



79. When selecting where an activity is to be performed, "Patient's home" shows twice.
80. When creating new activities in the activities tab, it was difficult to capture that users need to set the agent of the activity. Initially, users thought that by selecting "Me" or "Patient" they were already creating a new activity for that specific agent.

Feedback regarding system terminology:

81. Lipid options were wrong: options that were shown in the walkthrough document screenshot did not match what testers could see on the screen when testing the C3DP.
82. The HBA1c reference range is incorrect.
83. Haemoglobin is spelled incorrectly.
84. Units for recording alcohol are incorrect.
85. The terminology needs to be addressed in general.
86. On the medical summary page, the following words are suggested to be revised:
- 'Onset' in the Condition section should be 'Date of Diagnosis'
 - 'Onset' in the Medication section should be 'Commenced'
 - 'Onset' in the Risks/Scores section should be Date'

87. When creating a new care plan 'Addressed Conditions' (see below) may need rephrasing. It is also unclear how it is decided what conditions the list suggests. The list can be quite long if many conditions apply.

88. The 'Code' when adding an activity needs to be logical, e.g. for food photos this is a link rather than a code.

89. 'Classification of Drugs/Medications': the current C3DP version shows different classification criteria. We propose to try unifying the classification criteria according to a single criteria, i.e. glycemia related drug/medication.
90. Users suggest to consider renaming 'Further Suggestions' as it may be misleading since it does not reflect the aim and meaning that they experienced it to have during the test session.

4.4.2.3 PEP general feedback

1. Test user patients felt that the system has great potential but they did not feel that they would want to use it in its current format. Thus, patients aged 65+ over may struggle using it and recommend that system usage needs to be much simpler.
2. The text in the training material and the PEP manual is not simple enough and the terminology is too technical. Patients were not motivated to follow the training material.
3. The font-size of the training material was too small for some users.
4. Navigation through the system needs to be simplified and patients need to be guided through the system. Navigation test or instruction text is needed throughout the system. Users did not always understand what was expected from them.
5. Some testers found the PEP quite intuitive. However, the concern was raised that it is important to clearly indicate towards patients what they need to do next or what action is expected from them. That was not always the case.
6. The PEP must be translated in the national languages before deployment.
7. When test users could not answer a test question, they were unclear if that was based on their lack of skill or due to a non-existing functionality of the demo-version of the PEP.
8. A feedback button on goals and activities was missing on the PEP while it was actually explained in the training manual.
9. The user manual is quite lengthy. The length could be reduced by rephrasing the objectives in bullet points and reorganizing the content of section 3 with a more “executive” aim, tackling only the activities a user can perform.

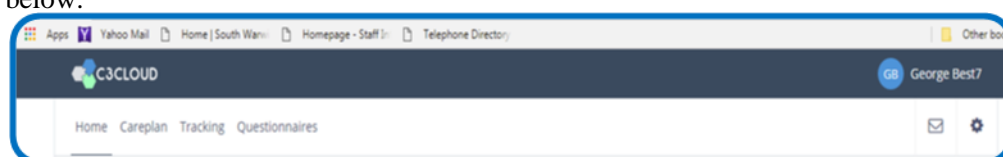
4.4.2.4 PEP specific feedback

Feedback regarding usability:

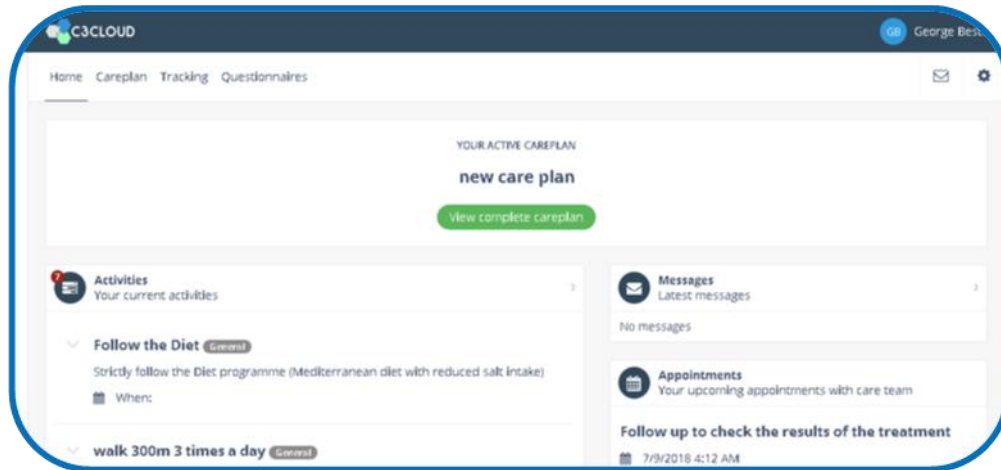
1. On the login-page: The title ‘**Patient Empowerment Platform**’ should be shown clearly at the top of the screen below with some simple instructions:



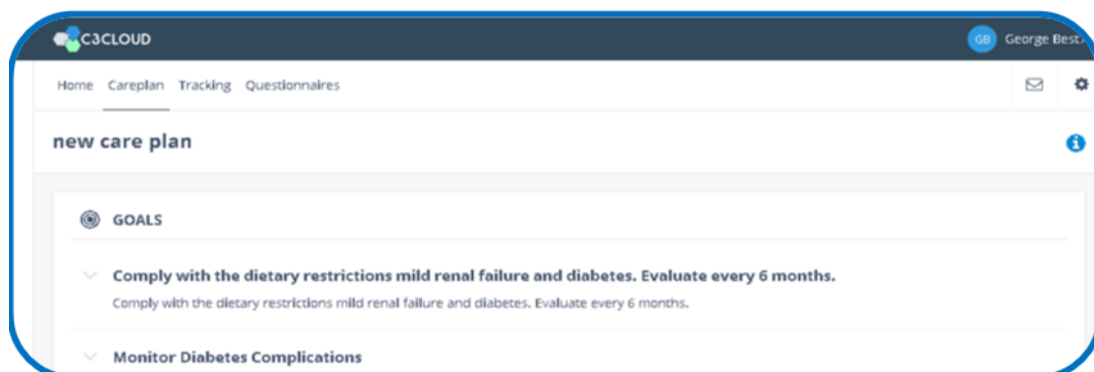
2. The header should show ‘Patient Empowerment Platform’ next to C3CLOUD in the black bar below:



3. The page 'Home' needs to be better structured. It has an information overload and looks too similar to the page 'Care Plan'.
4. The front screen (see below) should present only the title of the system (PEP), some instructions about what the patient can or should do next and the button to 'View complete care plan'. Detailed information should only be presented on next page:



5. Simplify and structure the information presented: e.g. 'Goals', 'Activities' (Medications) or 'Guidance'.
6. The 'Careplan'-page could show only the headings (the bolt-printed headings in the figure below) of any goals, activities or guidance. The heading could be highlighted if any care plan changes occurred and have not been seen since the last logout. The presentation of specific content regarding 'Goals', 'Activities' and 'Guidance' could be done at a next level after clicking on the respective heading. Patients want the screens to be as minimal as possible.

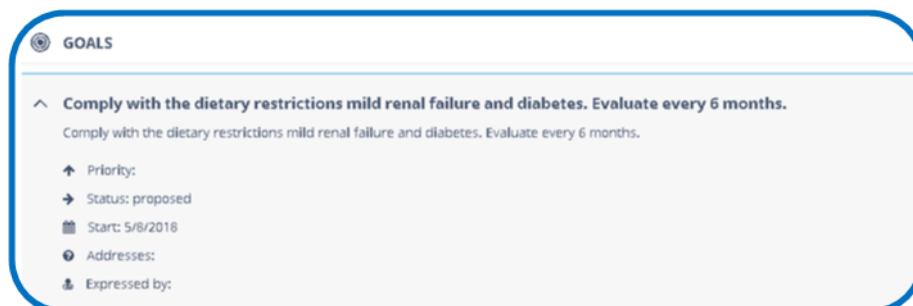


7. The font size needs to be larger; especially if the project is targeting patients aged 65+. Alternatively, on option to increase font size should be readily available.
8. The name of the person currently logged on to the PEP that is displayed on the top right corner: It could be made explicit that this is the name of the person who is logged in, e.g. 'You are logged in as XYZ'.
9. Patients disliked the need to scroll down the screens. One patient said she would not want to use the system if she had to scroll down. In addition, she suggested displaying goals, activities and guidance material on separate screens.
10. It was not intuitive for the users that clicking an arrow would open or close headings or boxes to show or hide additional information. This needs to be more obvious.

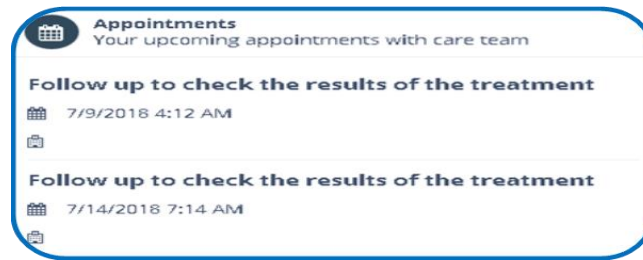
11. It should be possible to click on goals, activities, guidance, appointments or messages on the top bar below – similar as it is possible to click the ‘Home’, ‘Careplan’, ‘Tracking’ and ‘Questionnaires’ categories:



12. It is suggested using colours to identify actions for patients and to support patients in identifying where and action is required and where the data presented is just for information.
13. Questionnaires did not save in the system, e.g. ‘Medication side effects’
14. Buttons for ‘Next’ and ‘Previous’ screens should be available when completing questionnaires.
15. When a questionnaire is submitted, the ‘Home’-screen is shown. Users expected to come back to the ‘Careplan’-screen or even to the next questionnaire that they should fill in.
16. ‘Activities and goals on the care plan should be grouped by type rather than using colour coding, e.g. group all ‘General’ activities together and group all ‘Observations’ together etc..
17. Users suggest grouping care plan activities along other criteria more adapted to the patients. For instance: ‘Diet and Lifestyle’ could include ‘Photo upload’, ‘Walking’ etc.. The category ‘Treatment’ could include ‘Medication’, ‘Questionnaires’ related to medication side effect and ‘Blood Pressure Observations’.
18. Users were unclear if a patient should be able to see their past care plans.
19. Users wondered if patients can request material from their care team.
20. The questionnaire ‘Medication Side Effects’ had some questions in the wrong order.
21. The questionnaire ‘Medication Side Effects’ did not save after completing it on the PEP. It was thus also not shown in the C3DP.
22. Additional information provided for each goal was not always helpful (see below). It should be further elaborated what content is shown to the patient here.



23. ‘Activities’ do not clearly explain to the patient what they are expected to do.
24. Users could not click on ‘Appointments’ on the ‘Home’-screen (see below). Concerns were raised about showing appointments in the PEP at the SWFT pilot site: the PEP will not be used for scheduling at SWFT. Showing appointments and referrals on the PEP needs caution as they will be handled outside of the PEP system.



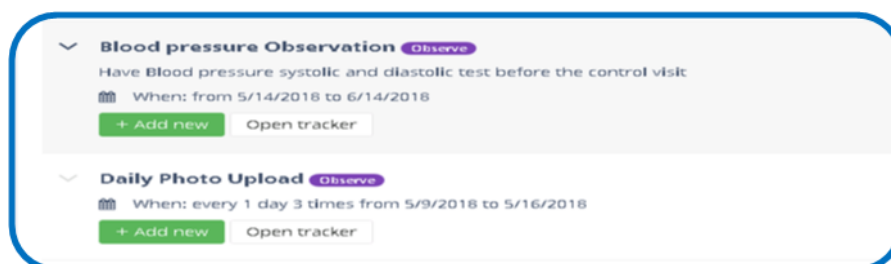
25. Users assume they would be able to schedule an appointment through the PEP.
26. The message envelope-icon on the right should be placed with the other tabs on the left. 'Settings' should stay separate (see below).



27. Users were unclear how patients will be notified of a 'New care plan'. Does a notification message go to an email account or through the messaging functionality in the PEP?
28. Users did not find an option to give feedback to the care team about the care plan or the goals and activities presented in it.

Feedback regarding terminology:

29. Any dates should be in British format.
30. The current labelling of activities can be confusing (e.g. 'Questionnaire' or "Observe"). One of the users thought it was a clickable button to update the progress an activity. Users suggest changing the design in order to make clearer the differences of activity categories.
31. When submitting a questionnaire through the PEP, the final page should state 'This is a summary of your previous data input. You can edit it if needed. When ready, please "submit" it'.
32. 'Open Tracker' on the 'Careplan'-screen (see below) is not an adequate term for the button to open the charts. Instead it could say something like: 'Show Previous Observations' or 'See Previous Photos'. Also, 'Add New' should say something like: 'Add New Photo'.



33. The heading 'Guidance' should be changed so it is clearer that it contains educational information that the patient should review. An introductory sentence could for instance say: 'Your healthcare professional has suggested that you review the following material'.
34. All main pages or sections on the PEP should have some text stating what the section is about and what the patient can or should do there.
35. The activity descriptions need rewording. Users wished they were more encouraging / inviting rather than ordering them to do something.

5 MOCK-UP REPORTING

The description of what should be done regarding the "mock-ups" feedback was already reported in D9.2 Section 3.1.1. However, in this deliverable the whole process of the mock-up feedback is detailed, taking into account the different performance per pilot site and the results are explained. This section describes the preparation of the detailed mock-ups of the user interfaces of the two main ICT components of C3-Cloud (C3DP and PEP), their presentation to the actual users of C3-Cloud in the three pilot sites (Basque Country-BC; Region Jämtland Härjedalen-RJH; and South Warwickshire NHS Foundation Trust-SWFT) and it summarizes their feedback and the comments from the technical partners. Eventually, these two ICT C3-Cloud components/solutions have been updated based on the users' feedback, as part of the layer 1 evaluation.

The C3-Cloud study is split into four layers to perform the evaluation and impact assessment of the study. Evaluation layer 1 aims to evaluate the user-centred design of the C3-Cloud application in order to ensure usability and adaptability of C3-Cloud ICT solutions by addressing their social and human context. This layer includes the software mock-ups, a component testing protocol and an application testing protocol. In this section we collect the report of the mock-ups.

In manufacturing and design, a mock-up is a scale or full-size model of a design or device, used for teaching, demonstration, design evaluation, promotion, and other purposes. A mock-up is a prototype if it provides at least part of the functionality of a system and enables the testing of a design. The most common use of mock-up in software development is to create user interfaces that show the end user what the software will look like without having to build the software or the underlying functionality. User interface (UI) mock-ups are one of the most important documents for developers because it is where they determine how to create the visuals, or even if they are possible. Software UI mock-ups can range from very simple hand drawn screen layouts, through realistic bitmaps, to semi-functional user interfaces developed in a software development tool. In addition to setting aside time to answer the important visual questions, mock-ups have several other benefits; they are intuitive to stakeholders, give a realistic perspective and allow for early revisions.

The ICT infrastructure of C3-Cloud has two main components, the **Patient Empowerment Platform (PEP) for the patient** and the **Coordinated Care and Cure Delivery Platform (C3DP) for members of the multidisciplinary care teams (MDT)**. In C3-Cloud, the user interface design of both components was started with mock-ups to get feedback from end users and the implementation is being done incrementally. The mock-up interfaces were prepared in the conceptual design task (Task 3.3) and have continued all along the implementation process in the framework of Task 3.4, which runs the entire, project and aims to guarantee co-production.

The feedback on the mock-ups of the two main ICT C3-Cloud components performed by the pilot sites is described by each component. After a short introduction, the methodology followed in the sites is detailed, and finally their review and analyses is reported as result.

5.1 Coordinated Care and Cure Delivery Platform (C3DP)

The aim of the Coordinated Care and Cure Delivery Platform (C3DP) is the creation and execution of personalized care plans for multimorbid patients, with the help of Clinical Decision Support Modules for recommendation reconciliation, poly-pharmacy management and goal setting. C3DP enables long-term, continuous, coordination of patient-centred care activities by a multidisciplinary care team (MDT) composed of health professionals, social care workers and homecare providers; and by the patients and their informal care givers, including family members.

Firstly, C3DP mock-ups were presented as a series of screenshots at the Warwick meeting in September 2016 "*PCPDP-C3DP Mock-ups*", which used the imaginary Swedish patient, Sven Karlsson as a C3-Cloud project patient. Then, between October and December 2016, clinicians from the different sites sent their mock-up feedback to the PCPDP/C3DP graphical interfaces developed by SRDC. Most of them have been already implemented in the further developments of the C3DP.

5.1.1 Methodology

The mock-ups proposed by SRDC were reviewed by the pilot sites, who gathered a multidisciplinary group of health professionals and asked them for their feedback on the mock-ups. To do this, pilot sites reviewed the screenshots and commented on the information presented to the healthcare professionals. On top of that, the health professionals were asked to bring up any topics and suggestions not yet present in the story. Their overall input was collected in a report that was shared with and considered by the partner developer of the C3DP platform for further development.

The methodology used followed the next steps:

- Firstly, high-level information about the C3-Cloud project was provided to healthcare professionals. The aim was that all the participants had a general overview of the project and intervention.
- Secondly, the C3DP and its main functionalities were explained in detail, according to the corresponding status of the platform.
- Finally, a debate/discussion took place on the basis of the healthcare professionals' comments and inputs.

5.1.2 Review of the C3DP mock-ups by the pilot sites

The following text summarizes the consolidated review of the three sites.

The overall reaction was very positive. Both the display and the functionalities were found to add value and are attractive. It allows the multidisciplinary team to produce a shared personalized care plan.

There were some issues to take into account. The most crucial was to ensure that the new tool did not overlap with the existing ones. It is vital to avoid duplication of work for the professionals involved. It is necessary to prevent doubling time and effort. The actions/activities performed in the local systems should not be replicated on the C3DP platform and vice versa.

Healthcare professionals understood that all the information, tests, surveys, reports, documents, etc. that are performed in local systems and requested by the C3DP platform for the development and/or execution of the personalized care plan, would be directly loaded, upon request, to the C3DP from the local EHR. It should be a two-way process. All the information, tests, reports, etc. developed under the C3DP platform should be accessible to the local systems. We have to prevent unnecessary repetitive activities, and thereby address the efficient clinical practice.

Moreover, a graphic display of all upcoming patient interventions (treatment, follow-up activities, referrals, milestones or events) for the patient in the following months (i.e. one year) was found to be desirable. It would allow seeing at a glance the whole care plan.

Detailed comments:

- Information of the patients (slides 2-3): The slides 2 and 3 are similar in content to some screens in “Osabide Global” (OG), the local EHR from Osakidetza. The information is showed in OG, regarding for example all patients scheduled in a specific day’s Agenda. Can you reach patient Care Plan directly from his EHR skipping slide 2?
- Care plan history of the patient (slide 5): Can we only have “visible” the active Plan? The “completed” ones could be reaching by request.
- Existing Care Plans (slide 7): What is this folder? Is it just where the patient care plans are kept? Or is it for all Care Plans?
- Detail of the care plan of the patient (slide 8): What do the stars in the goals section mean?
- Addition of a new health condition (slide 11): There is a list of Health Concerns in some of the local EHR. Would this slide “pull” data from it? Or will it be done manually here? Or will be semiautomatic?

- Scales and Scores (slide 12): Mini-mental, Barthel and other information.... If they have already been recently performed or updated in the local EHRs, they should be uploaded directly from it (or under request. It should not be necessary to do it again if the information is already stored in the local system. Otherwise, it's fine to do it using these screens!
- Edition of health concerns (slide 16): The notes edited in "Health Concerns" should be transferred and also available in the local EHRs.
- Care Plan templates (slide 19): What does "Care Plan Templates" mean? Is it a draft structured care plan based on guidelines recommendations to be customized for the patient? Is it just a blank template to be completed by the Health Professional? Is it just a few selected (but not complete) list of health concerns, goals or interventions?
- Addition of a new goal (slide 22): What is the difference between Goal and Target? What do exactly both concepts mean? Is it just that the target has a number attached?
- Addition of a new goal (slides 22-24): The meaning of these slides was not understood. Could you give a more detailed explanation, please? Will the notes be available too in the local EHRs?
- Addition of a new activity (slide 31): This functionality is already available in Osabide Global. The same comment as for slide number 12. Whichever platform where the action of booking an appointment is performed, it should be available in both of them.
- Addition of a new activity-appointment (slide 35): Referral to the cardiologist. This functionality is already available in "Osabide Global". The same comment as for slides number 12 and 31. It is essential not to repeat actions among platforms, where the information is already stored in one of them.
- Edition of a new activity-appointment (slide 42): It is proposed to broaden this action/activity, allowing professionals to add/upload related data/information they consider of interest.
- Save and share the care plan (slide 55): There are already inter consultation templates available in some of the local EHRs. Information should be available on both platforms to avoid gaps and duplications.
- Graphic overview of the care plan (slide 61): interesting overview of Care Plans History. However, we would also need a screen with a graphic display on a timeline of all upcoming interventions (one year forward?)
- Clinical documents of the care plan (slide 62): The clinical documents are already available in "Osabide Global".
- Synchronization with local care systems (slide 64): What does "synchronize" mean? Would it cover all the above-mentioned concerns on gaps and duplications?

Appendix Appendix 7Appendix 7collects the answers of the partner developer of the C3DP (SRDC) of the feedback on the C3DP mock-ups.

5.2 Patient Empowerment Platform (PEP)

The objective of the Patient Empowerment Platform is to provide access for the patients and/or informal caregivers to the published care plan and relevant information, and thus increase patient and informal caregiver participation to decision making and self-management. It aims to improve the interaction between patients and health professionals and to collect relevant information to enable the monitoring of care plan related activity status and progress.

Pilot sites asked their patients and health professionals for feedback about the PEP mock-ups in order to evaluate if they fulfil their requirements. The scope of this review was fairly high level. The detail

about what else the patients would like to see in the system will be done later as part of the formal evaluation.

Members of the local project team on each site gathered a small number of patients in a meeting to review and comment the mock-ups proposed by MEDIXINE (the partner developer of PEP). The feedback of the patients was assembled and the partner developer has used the feedbacks to revisit the mock-ups to address the comments received from each pilot site. As a general comment, for the three sites, the patients that participated in the review belong to diverse patient forums and were perhaps more familiar with critical review and more healthcare savvy than the ‘average’ patient.

5.2.1 Methodology

The end users were asked for their feedback about the PEP mock-ups to evaluate if they fulfilled their requirements. To do so, each site’s local project member team had a meeting with a small number of patients; their reviews and comments on the mock-ups were assembled in a report. Eventually, the report was shared with the lead partner responsible for the platform in order to address the comments received from the pilot sites. The methodology used in the three sites was similar to the one followed for C3DP, but for PEP, the end users are patients, rather than professionals.

In order to increase the feedback received from the end users, the evaluation of the PEP was performed in the three pilot sites on different dates, using different versions of the platform as working material. The aim has been to obtain as much valuable information as possible from the users regarding the software component PEP. Two sites (BC and RJH) performed the PEP mock-ups evaluation using the same version of the PEP and for that reason they followed the same methodology. On the other hand, SWFT patients carried out the assessment later, so they were able to evaluate a more advanced version of the platform. This latest version consisted of a real demonstration, during which the users could visualize and give feedback regarding a real example.

5.2.1.1 Basque Country (BC) and Region Jämtland Härjedalen (RJH)

In these two sites, the meeting with patients had two main objectives:

- To know if the approach of the project could help patients to: improve understanding and treatment options; to become more involved and to participate in the follow-up of their illness together with a health professional.
- To obtain from the patients a first feedback on the design of the Patient Empowerment Platform.
 - To do so, screenshots showing different functionalities of the platform (Registration; View care plan: activities/overview/goals/guidance materials; Questionnaires; Register measurement values manually; Safe messaging; Progress update) were presented to the end users. These screenshots were obtained from the document “*Storyboard - PEP - Medixine Suite - 0.7*”. Moreover, in the case of the Basque pilot, these images were translated into Spanish to facilitate the debate.

Accordingly, the discussion/debate with the users was about the core of the project and the design and content of the platform.

To discuss the core of the project, the following seven questions were used:

1. *To what degree do you think the use of the C3-Cloud services can contribute to improving your understanding of health information that you receive from health professionals, as well as information received in a written form such as test results, medical reports, etc.?*
2. *To what degree do you think the use of the C3-Cloud services will help you better understand your health / disease, its possible developments, and treatment options available?*
3. *Do you think the use of the C3-Cloud services will contribute to making you become more involved in monitoring your health status and treatment progress, and if so to what degree?*
4. *To what extent do you think the use of the C3-Cloud services will help you better adhere to treatment plans and lifestyle adjustments?*

5. *Do you think the use of the C3-Cloud services will help you become more actively involved during a consultation with healthcare professionals, and if so to what extent?*
6. *How will the use of the C3-Cloud services impact on your relationship with healthcare professionals?*
7. *Other issues that have emerged with respect to patient empowerment*

To debate and collect feedback about the design of PEP, 5 key items/concepts/areas were tackled:

1. Functionality of the PEP
2. Content of the PEP
3. The language used in the PEP
4. The level of detail (“granularity”) of the PEP
5. Presentation of the PEP to the user (“user friendliness”)

5.2.1.2 South Warwickshire Foundation Trust (SWFT)

Two members of the local project team met with 5 patients at the Rother House Medical Centre. The patients were selected from the Rother House Patient Forum. Firstly, the local project team gave an overview of the project and what it is trying to achieve. Then they asked the patients to look at the screens and assess PEP and the care plan from the point of view of usefulness, usability and understandability. The online PEP mock-ups with the sample Care Plan was presented to the patients on a big screen. They looked at it in sections, starting with the login screen, followed by the care plan summary page, the detailed care plan, tracking and questionnaires. Finally, feedback was obtained as they went along as well as at the end of every section.

5.2.2 Results

5.2.2.1 Region Jämtland Härjedalen (RJH)

In RJH, members of the local team gathered MDT members and patients and reviewed the PEP mock-ups, using screenshots of the platform. In general, they liked the design of the web pages. Some specific issues were on the two following topics:

- Presentation of the key elements of the Care plan (goals and activities): the active goals/activities should be presented in black, possibly bold (instead of a grey shaded manner).
- Medication request (Figure 29):
 - The design could be improved in order to help the patient and/or informal caregiver to see what is most important.
 - The actual drug and dosage is important and should be in the beginning of this section (bold).
 - The name of the prescribed drug (bold) should be presented together with the generic name, in brackets (grey). In Sweden there is an option of generic substitution at the pharmacies.
 - In the case of shorter treatments, it is desirable to have information regarding what day the medication is stopped.
 - There is some information overload and can be confusing to the patient. The date of starting the treatment is not of interest and doesn't need to be presented here. Although to show that administration route is fine, the presence of the numbers (34206005) can be confusing. ATC-codes should be removed as they are of no interest to the patient.
 - Dose units should be updated according to each pilot site.

Medication

Mealtime insulin three times a day

📅 When: every day 3 times at breakfast and at lunch and at dinner from 2016-09-02

Instruction: 5 E mealtime insulin at breakfast, lunch and dinner

Dose quantity: 5 IU

Code: insulin (human) (A10AB01)

Route: Subcutaneous route (34206005)

Authored on: 2016-09-02

Update progress

Figure 29: Screenshot of the medication request in PEP.

5.2.2.2 South Warwickshire NHS Foundation Trust (SWFT)

The feedback received from the patients was incredibly positive. They thought it was a brilliant step forward in involving patients more actively in their own care. They felt that it was a very positive step in moving the balance of responsibility between healthcare professionals and patients. One of them actually said that they thoroughly enjoyed the session and would really like to be involved in more detailed evaluation.

The feedback included the following:

- They found the system very patient focused / patient-centric
- Dates should be presented in the UK format, e.g. 21/03/2018
- They didn't like some of the phrasing. In particular, the term dietary 'restrictions' – they felt it was negative
- It may be better to avoid using units of measure for patients, e.g. for blood pressure they understand 130/80 on its own
- The language used needs to be reviewed in detail so that it is more easily understood by patients and in some places simplified. For example, the patients didn't really understand the concept of 'chronic disease'
- When questionnaires are submitted a message is given that the answers will be reviewed and discussed with the patient. They felt that we need to be sure that this will happen as we could be setting false expectations. If patients complete questionnaires they will be disappointed if they are not acted on. Healthcare professionals have busy schedules so this could easily happen
- They feel that the Care Plan Feedback questionnaire could be improved and simplified. They suggested that we could have just pick lists with a single comments box rather than lots of free text boxes. They felt there was some duplication
- On some screens there are 'Next' buttons but no 'Back' buttons. In some cases the patients wanted to go back to a previous screen and couldn't
- Without any prompts from the project team, patients felt that it was extremely important to include over the counter medications and complimentary therapies!!
- A major point they raised was about having visibility in PEP of the following: -
 - All of their medical conditions (as some patients don't always know what they are being treated for or have been diagnosed with!)
 - All of the medications they are taking

Appendix 8 gathers the comments of MEDIXINE, the partner developer of PEP, based on the feedback of SWFT end-users (patients).

5.2.2.3 Basque Country

In the Basque Country, members of the local team brought together 4 patients to review the PEP mock-ups. In general, they liked the design of the web pages. Their feedback was collected in a structured way according to the two main topics of discussion: core of the project and design of PEP.

1. Core of the project

- **Question 1.** *To what degree do you think the use of the C3-Cloud services can contribute to improving your understanding of health information that you receive from health professionals, as well as information received in a written form such as test results, medical reports, etc.?*
 - C3-Cloud could contribute to much improvement. For this, the PEP has to be easily accessible for the patients.
 - It is an advantage. It provides information about pathologies and it is not necessary to search this information in other sources.
 - It is complex, especially to the people who are not familiar with these tools. So it is important to offer training to those users on how to use this tool.
 - It is essential that the PEP is user-friendly.
- **Question 2.** *To what degree do you think the use of the C3-Cloud services will help you better understand your health/disease, its possible developments, and treatment options available?*
 - To facilitate access to appropriate information (availability of the training and easy to access in the PEP) is crucial. This is the first step to empower patients.
 - It may be beneficial for patients who are already empowered. For patients who are not yet empowered, they should first be made aware of the need to be empowered.
 - The materials available have to be verified, apart from being agile and easy to understand.
 - All professionals involved in each patient treatment should have enough knowledge and understanding of this platform, such that, in the case the patient has any doubt regarding its use, it could be solved by any professional.
- **Question 3.** *Do you think the use of the C3-Cloud services will contribute to making you become more involved in monitoring your health status and treatment progress, and if so to what degree?*
 - The patients agree.
 - In general, patients are more motivated to follow the treatment when their opinion, skills and their daily life are taking into account.
 - The caregivers have to become familiar with the platform.
- **Question 4.** *To what extent do you think the use of the C3-Cloud services will help you better adhere to treatment plans and life-style adjustments?*
 - According to the patient expectations, before using the PEP, the patient has to be aware of what he/she aims to achieve.
 - The patients have to be familiarized with the platform in order to take advantage of all the available services and to achieve a better adherence to the treatment.
- **Question 5.** *Do you think the use of the C3-Cloud services will help you become more actively involved during a consultation with healthcare professionals, and if so to what extent?*

- Patients are more involved in their treatment and have more knowledge about their condition. They are empowered. Therefore, they can contribute and share decision making with the health professionals about their personalized care plan.
- **Question 6.** *How will the use of the C3-Cloud service impact on your relationship with healthcare professionals?*
 - The use of the platform can help to improve the relationship with the professionals.
- **Question 7.** *Other issues that emerged with respect to patient empowerment*
 - The notifications would be sent by email. It is not very common that the patient can access email easily. They propose to think of other options such as SMS.
 - Availability and skills issues: Access to the devices at home. Maybe they do not have devices, or they do but they do not know how to use them.
 - Social aspect is missing.
 - They propose to give access also to other specialists, such as nutritionists, pharmacists or social workers.
 - It is important to define the period that data has to be uploaded by the patient. For example, to measure the blood pressure everyday can be complex for patients.
 - The next of kin could also have access to the platform.
 - It is very essential to be trained properly before using the platform.

2. Design of PEP

- *Functionality of the PEP*
 - The platform must to be responsive; it has to be adapted to any device.
 - The access to the platform has to be easy and friendly.
 - Sometimes to fill out similar questionnaires can be boring and complicated.
- *Content of the PEP*
 - It seems nice. They recommend “light” content that does not overburden the patients. The content should also be available to the informal caregivers.
 - Light but informative as well (i.e. which exercise? when? how?).
 - Provide information of how to measure different values, how to enter the information, etc.
 - “Update the progress” is not well understood.
It is very important to consider patients’ emotions. Also, it is important to give them the chance to express their emotions in the platform or share them with other patients.
 - They appreciate having access to information about mentors in their Health System.
 - Give information to other sources.
- *The language used in the PEP*
 - The technical jargon has to be understandable.
 - They propose to change some words, for example to add the term “coaching”.
- *The level of detail (“granularity”) of the PEP*
 - Although “light”, the content should be very explicit. (i.e. which exercise? when?, how?)
 - Maybe it would be interesting if patients have the authority to give access to others.
- *Presentation of the PEP to the user (user friendliness)*
 - The simpler, the better. It has to be a support tool for the patient, not a burden.
 - It can be helpful if it is indicated how the user has found or arrived as to the content. Add a guide would be desirable.
 - Take into account that sometimes filling in questionnaires using the mobile can be a complex task.
 - Include more interactive contents or images.

6 HEURISTIC EVALUATION

6.1 Introduction

Heuristic Evaluation (HE) is a process that is part of the usability engineering of an ICT system. HE sees the system as a black box, by focusing only on the interface of a system. In the case of C3-Cloud, HE focused on the PEP and C3DP interfaces, for patients and healthcare professionals respectively. HE is performed by individual reviewers isolated from each other, and at the end of the process, results are collated in a report (this report), which is fed back to the developers. HE is a process that is part of the iterative development process of a system. HE can reveal a number of issues about the system. Examples of these include bad design that may lead the user making a slip or mistake, as well as design that may be seen to not appreciate the sensitivities of the user (e.g., system dialogues). All these issues are classified in a number of categories, which are the heuristic categories.

HE is considered to be very effective in identifying issues with system interfaces. Figure 30 illustrates that a relatively small number of reviewers can identify the majority of issues in an interface, and that this particular evaluation method is most cost effective when done with five reviewers.

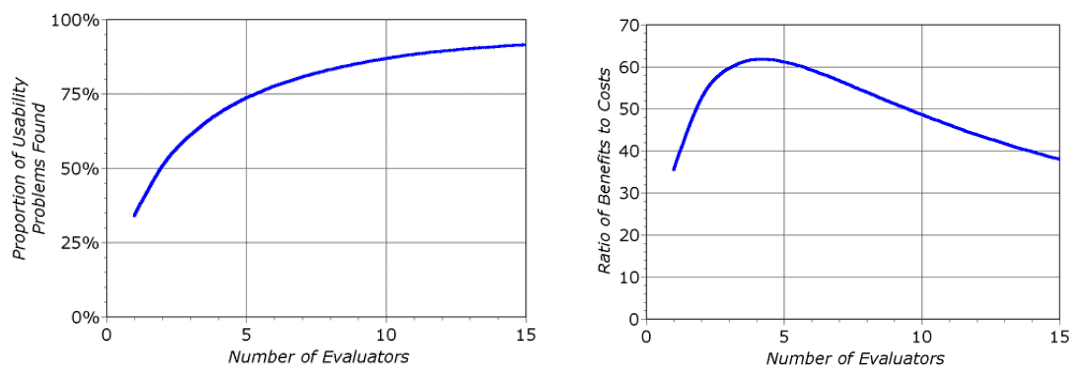


Figure 30: Heuristic Evaluation illustration that a relatively small number of reviewers can identify the majority of the issues in an interface

HE is an activity that also reinforces co-production of the system as it involves a number of people with a range of expertise.

6.2 Method

Five specialist, usability evaluation reviewers from the Institute of Digital Healthcare, University of Warwick, UK, conducted the Heuristic Evaluation during the period 31/05/2018-06/06/2018. The spread of expertise of the reviewers ranged from systems and software engineers, to clinical scientist, with experience in using, as well as developing health IT systems.

The heuristic evaluation in C3-Cloud consisted of the following steps:

- 1) Reviewers attended a brief thirty minute presentation that explained the purpose of the evaluation, the process that would be followed and its documentation, as well as the definition of the heuristics that would be reviewed.
- 2) Reviewers reviewed the manuals prepared for PEP and C3DP, which in addition to the description of the functionality, contained an example walkthrough, designed by the technical partners, designed to ensure coverage of the entirety of functionality and menus that can be accessed through the interfaces.

- 3) The reviewers made a first structure-free evaluation of the interfaces, keeping unstructured text notes.
- 4) A second structured pass was done by following the workflows described in the manuals; comments were classified under each heuristic.
- 5) Based on the comments collected, reviewers filled out a spreadsheet with common issues for each heuristic category, further structuring the process, ensuring that all interfaces had been considered for all issues of interest. The spreadsheet also requested a subjective evaluation of frequency of each issue, along with a reviewer-based assessment of criticality for each issue. Frequency and severity were combined to create an overall risk metric that will prioritize the modifications by the technical teams.

Figure 31 presents the risk framework and Figure 32 the risk acceptability framework.

<i>Severity</i>		<i>Frequency</i>	
4	catastrophic	4	90%
3	major	3	51-89%
2	minor	2	11-50%
1	cosmetic	1	1-10%
0	none	0	1%

Figure 31: Heuristic evaluation risk assessment framework

	<i>Catastrophic</i>	<i>Major</i>	<i>Minor</i>	<i>Cosmetic</i>
<i>Very frequent (90%)</i>	4	4	3	2
<i>Frequent (51-89%)</i>	4	3	3	2
<i>Likely (11-50%)</i>	4	3	2	2
<i>Unlikely (1-10%)</i>	3	2	1	1
<i>Rare (1%)</i>	2	1	1	1

Figure 32: Risk acceptability

The following risk acceptability categories were identified and will be used to address heuristic evaluation issues:

- 4) Issue threatening the success of the project in terms of technical acceptability, as well as by affecting the results by sub-optimal or wrong use. These issues will need to be fixed urgently and take priority and will be ensured by the Coordinator.
- 3) These issues may significantly affect the experience of the user, skewing the results of the project. These issues are of high priority but may be balanced with other important activities. The Coordinator will ensure that they have been added in action plan of the relevant partners.

- 2) These issues may affect the experience of the users but without affecting the results of the project. Addressing these issues will be done by the PEP or C3DP work package leader who will inform the STMB on progress.
- 1) These issues are minor nuisances which are unlikely to affect the project. These issues will take lower priority over other project actions. The respective technical partner will report to the WP lead on progress.

The C3-Cloud HE evaluation considered the following heuristics:

- 1) *Visibility of system status*, giving feedback at all times to users about what is going on.
- 2) *Match between system and the real world*, which examines whether the user would meet in the system familiar and intuitive terms rather than system specific jargon.
- 3) *User control and freedom* allowing the users to exit functions quickly as well as allowing redo and undo.
- 4) *Consistency and standards* ensuring that the system uses the same concepts for the same purpose throughout (e.g. patient activity).
- 5) *Error prevention* checking the presence of checks for errors, dialogues for notifying of an error as well as option to correct a potential error.
- 6) *Recognition rather than recall* enabling the users to use the system intuitively by recognizing the purpose of each item in the interface rather than needing to recall knowledge from the manual or training.
- 7) *Flexibility and efficiency of use* allowing the customization of the interface to improve the interaction speed of the expert user.
- 8) *Aesthetic and minimalist design* checking for the appearance of the interface as well as suitability and efficacy of dialogues and general presentation of information.
- 9) *Help and documentation* offering access to the system's documentation and help pages.
- 10) *Error recovery* evaluating whether the system offers unambiguous and clear information of errors as well as instructions for recovery.
- 11) *Skills* evaluating whether the users can operate the system with ease.
- 12) *Pleasurable and respectful interaction with the user* checking whether the design allows the user to navigate without difficulty (e.g. use of icons), as well as offering users appropriate dialogues and pleasurable exchanges
- 13) *Privacy* checking whether private functions are isolated behind secure access, and whether the user is properly informed about it.

6.3 Results – C3DP Component

The following represent the results of the HE evaluation on the C3DP component. Every heuristic is discussed in terms of overall evaluation and specific usability issues are provided, ordered in terms of Severity and Criticality.

6.3.1 Visibility of system status

This heuristic has only been partially satisfied. Visual feedback, such as animations that the system is working or information is loading, exists. However, frequently, operations lack feedback to notify the user something has happened. Specific usability issues identified include (order in terms of Severity and Criticality):

1. Visibility of System Status		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	When logging into the system, after login screen, sometimes not directed to C3DP but to authorization manager. This should not happen - a different message should be displayed if there is a delay or redirection has failed.	4	3	7
2	If the system timeout on privacy acceptance page occurs, the system logs into a separate dashboard and there is no indication that page has not loaded correctly	4	2	6
3	Clicking "care team" before care plan is finalized results in perpetual loading (fetching care plan shows indefinitely)	4	2	6
4	When editing patient data, it is not clear if the changes have been saved	3	4	7
5	Removing oneself from a care team has no effect	3	3	6
6	No indication when a session has timed out	3	3	6
7	No pagination on search page and search does not return all results – misleading user	3	3	6
8	The status of some icons is unclear. For instance, on Care Plan, the icons for Activity Actions and Materials are not clear - sometimes you can click on them and sometimes not - unclear how to use when	3	3	6
9	Feedback on next actions is not very clear for care planning activities when suggested by CDS. If you follow the suggestion and click create, there is no requirement to go and edit it further to add important details to make this activity complete for your care team or the patient	3	2	5
10	Save buttons on the Care Plan > Patient Data section does not change to inform whether data has been saved or not.	3	1	4
11	It is unclear that the "save" button on progress notes only apply to the note and not the activity.	3	1	4
12	No feedback from "save" button on chronic disease profile	3	1	4
13	New or updated goal or activity is not highlighted, when side window is closed.	3	1	4
14	No feedback from "join button" on patient search	3	1	4
15	No indication that CDS suggests a goal or activity, until a new one is created	3	1	4
16	Messages sent to own account, do not appear	3	1	4
17	Selecting "completed" for cancelled activities has no effect	3	1	4
18	In patients view, it is not clear how patients are ordered	2	3	5
19	Recipients for messages appear clickable, when viewing a message, but nothing happens when clicked	2	3	5
20	Next review date acts like a button but doesn't have any functionality	2	1	3
21	On the patient search page, there is no indication that an empty screen means "no patients" returned	2	1	3
22	After removing oneself from "care team", the selection dialog is still visible	2	1	3
23	Notification icons are too small and could be missed	1	4	5
24	The slightly different shades of blue on the navigation menus make it a little difficult to clearly see which item is selected versus on-hover, etc.	1	4	5
25	Login screen has "change provider option" but does not show the current selection	1	1	2

6.3.2 Match between system and the real world

This heuristic has only been partially satisfied as many functions have been left unexplained and do not follow common standards seen in other systems (e.g. the messaging system). Specific usability issues identified include (order in terms of Severity and Criticality):

2. Match Between System and the Real World		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	Addresses do not have right input list	4	4	8
2	No tooltips to indicate what icons mean	3	3	6
3	Range not clear if normal vs. allowable range	3	2	5
4	Mandatory fields on care plan not indicated	3	2	5
5	Own patients do not appear in patient search	3	2	5
6	Unclear how certain patient data relates to a tab (Some fields appear on multiple tabs which makes data entry confusing)	3	2	5
7	Clicking edit for task with same name as another task brings up the details for the first entry, not the one clicked	3	2	5
8	Cannot choose which message in a thread to reply to	3	2	5
9	Cannot send saved draft messages without first editing them	3	2	5
10	Not clear if the patient data in the care plan is the same as the patient data in menu	3	2	5
11	Menu choices do not have readily understood meanings, e.g. BP Management etc. in care plan	3	2	5
12	Interpret field for vital signs use unclear	3	1	4
13	Charts do not take into account time between recordings	3	1	4
14	Unclear what Onauth vs. Region options mean during log in, no explanation or help available	3	1	4
15	Privacy acceptance request does not state who is getting access to what data	3	1	4
16	New/Join on search page not adequately explained online	3	1	4
17	Process for deleting a goal is confusing – an extra field appears without a reason	3	1	4
18	No “reply all” option on messages	2	4	6
19	Previous messages in thread do not appear below current message when composing	2	4	6
20	No distinction between messages to and from another user when viewing multiple messages in a thread	2	4	6
21	Search box not automatically given focus after selecting search	2	3	5
22	Cannot clear message filters individually	2	3	5
23	No clear explanation or distinction between medical summary, chronic disease profile and patient data sections (e.g. patient data should be patient provided data)	2	3	5
24	Icons are not always familiar and obvious to the user. E.g., a) the ID? icon on the patient info, the icon for tests for care plan activities, b) Care plan -> activity: not clear what the difference between the “done” and “completed” icons are, c) Care barriers icon in medical summary not intuitiv. (Info tips on hover would be useful (e.g., there is an info tip on repeating activity icon but not others.) Also a legend and system user guide would be useful)	2	3	5
25	Need box around added performers for questionnaire as red cross looks like something has failed	2	2	4
26	No list view for activities calendar (hard to see distant tasks)	2	2	4
27	Menu choices are not always ordered in most logical way.	2	2	4
28	Computer jargon is used in places	2	2	4
29	Not all fields have prompts or instructions about what the data field is and what is expected of the user. Reminders are useful even for the familiar user	2	2	4
30	The system does not automatically enter leading or trailing spaces to align decimal points	2	2	4
31	The system does not automatically enter a dollar sign and decimal for monetary entries	2	2	4
32	The system does not automatically enter commas in numeric values greater than 9999.	2	2	4
33	Unclear that clicking on chart icon on patient summary opens a chart	2	1	3
34	Care plan creation warnings appear at bottom of page instead of top	2	1	3
35	Right arrow indicator on message when arranging inbox by thread leads to message instead of expanding if no nested message exists	2	1	3
36	Yes/No answers appear as tick/cross on questionnaire responses	1	3	4
37	Charts with 1 entry appear on left axis (center would be more readable)	1	1	2

6.3.3 User control and freedom

This heuristic has not been well-satisfied as many options to undo operations executed in error are missing, especially the option to modify/delete care plans when they are incorrect or created in error. Specific usability issues identified include (order in terms of Severity and Criticality):

	3. User Control and Freedom	Severity Rating	Frequency	Criticality
No	Usability Issue			
1	No close icon for open charts	3	4	7
2	There is no Undo function	3	2	5
3	Users cannot easily reverse their actions e.g. a) unable to delete new goal or activity, b) no option to delete care plan or modify selected options once created	3	2	5
4	No option to change authorization settings after login	3	2	5
5	Cannot edit goal template before adding it to plan	3	2	5
6	No option to change user profile or settings	3	1	4
7	No back option on screen	3	1	4
8	Cannot change member roles after creating care plans before request is approved	2	2	4
9	Some information such as "set by" not prepopulated after CDS task selection and remain uneditable	2	2	4
10	Cannot close care plan on previous care plans screen	2	2	4
11	No close button on dialog when pinning vital signs to patient data page	2	1	3
12	Non-manager can cancel care plan team requests to other users made by the manager	1	1	2
13	Users have no option of using a keyboard shortcut	1	1	2
14	Users cannot set their own system, session, file, and screen defaults.	1	1	2

6.3.4 Consistency and standards

This heuristic has not been well-satisfied. The project has no standard for design. Although wordings and actions are fairly consistent across, there appears to be some inconsistencies: a) in the presentation of data such as the messaging system and activity calendar, b) not all icons are labeled or provide info tips of what they mean, c) where colour is used, there is a lack of explanation of what different colours mean, e.g. black versus olive colour text for activities c) there are not many field prompts and prompts don't provide much more information than the field label. d) "Save" buttons are a little inconsistent. Sometimes, there are "Save" buttons for field groups, sometimes for individual fields. Sometimes, the word "Done" is used instead of "Save" e) Using the tab key moves along navigation menus (identified by the URL at the bottom of the screen) but this is not reflected on focus on the screen (equivalent to on-hover effect).

Specific usability issues identified include (order in terms of Severity and Criticality):

4. Consistency and standards		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	Outlines for buttons and icons do not appear on Safari browser	3	4	7
2	Filtering of patients does not work correctly if multiple words are typed into the search box (patients with partial match are returned)	3	4	7
3	No validation on data entered for lab results	3	3	6
4	Product change for prescription not mirrored when looking at activity list	3	2	5
5	Personalised CDS activities still appear when creating a new activity even after being added	3	2	5
6	Comments made by Patient Test User comes up as Anna Svensson	3	2	5
7	See all from notification menu goes to system messages even if user messages are in list	3	2	5
8	Recommended goal text changes after selection	3	1	4
9	Chronic kidney disease dropdown appears inside patient data panel resulting in 2 scroll bars (cumbersome) instead of extending outside the panel	3	1	4
10	Lipid test suggestion different from that shown in manual	3	1	4
11	All details from appointment made via care plan are not visible on calendar entry	3	1	4
12	Unclear whether trash symbol on pinned vital signs would remove block or delete entry	3	1	4
13	Unclear whether trash symbol on pinned vital signs would remove block or delete entry	3	1	4
14	Searches do not accept wildcards	2	3	5
15	Mix of capitalized and non-capitalised letters on patient summary (e.g. medication)	2	2	4
16	Grammar for medication frequency incorrect	2	2	4
17	Ordering encounters by health professional includes titles, names of HCPs inconsistent	2	2	4
18	Patient details in my patients screen not prepopulated until navigating away from the page after joining the care team for a new patient	2	2	4
19	Read messages still appear in new messages panel on dashboard	2	2	4
20	No password strength settings	2	1	3
21	Unclear where 'Profile Information' on the privacy acceptance request originates from	2	1	3
22	Web page flashes with different layout after accepting agreement	2	1	3
23	Unclear that search field on patient page only searches other patients and not your own	2	1	3
24	Search box on care team page has scroll bar but does not show all practitioners available (misleading)	2	1	3
25	Unclear that uneditable fields originate from EHR	2	1	3
26	CDS suggested tasks e.g. "Have blood pressure test..." descriptions change after addition	2	1	3
27	Outcome on education materials blank and uneditable	2	1	3
28	Status of education materials not displayed in list view	2	1	3
29	Message panel on home page does not mirror unread messages	2	1	3
30	Cannot set any parameters for appointment types other than appointment until after creation	2	1	3
31	Manual section 3.4.1 has multiple language errors, hard to understand	1	3	4
32	When zooming out, right hand panel does not extend to bottom of page	1	2	3
33	There are too many icon types	1	2	3
34	"Onset" for medication, incorrect word	1	1	2
35	Cancel request dialog on care team page does not have the same styling as the site	1	1	2
36	Red box in wrong place in manual (page 8)	1	1	2
37	Incorrect English used in manual (section 3.3.3)	1	1	2
38	Title of blood pressure chart is odd: "...with all children optional"	1	1	2
39	Integers or real numbers are not justified or aligned	1	1	2

6.3.5 Error prevention

This heuristic has been partially satisfied. While there were very few errors experienced during testing of the system, missing validation for user entered data presents a vulnerability. Specific usability issues identified include (order in terms of Severity and Criticality):

5. Error prevention		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	No stop date displayed for medications	4	2	6
2	Out of range value error warnings are not available, e.g. BP of 1000 can be entered	3	3	6
3	Error when clicking “accept” on the privacy acceptance request (related to timeout?)	3	2	5
4	Practitioners on care plans can be classified as family members, etc.	3	2	5
5	Activity could not be created, error when trying to create an activity with a progress note	3	2	5
6	No validation of files uploaded for education material (can upload malicious or large files which break functionality)	3	2	5
7	URLs to education materials not validated	3	2	5
8	Blood pressure observations shown in activity do not indicate if this is from before or after the activity was created	3	1	4
9	Can set next review date to before today	3	1	4
10	Searching on location type for appointments in care plans results in duplicate entries in the dropdown	3	1	4
11	Menu level "Activities" is named the same as section "Activities" within a patient care plan and can be a little confusing. "Activities" on the higher level menus is actually “All” activities for patients with active care plans	2	2	4
12	Fields in data entry screens and dialog boxes do not always contain default values when appropriate	2	2	4

6.3.6 Recognition rather than recall

This heuristic was partially satisfied. While most information is readily available, options available in dropdowns are often hidden even when searching and no documentation is made available to help users make selections. Specific usability issues identified include (order in terms of Severity and Criticality):

6. Recognition rather than recall		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	File downloads of charts are all named file (no meaningful names)	3	4	7
2	Zones are quite wide in places but do not look too cluttered. Patient Data section in Care Plan has many sub groups that are not that distinct between them. Use of lines or more spacing around those areas	3	3	6
3	For fields that have several readings, like BP, once you want to look at all the history, the list is not broken down further into groups, so could potentially be a long list. Groupings could be considered. Similarly, in the Chronic Disease Profile, some zones are very long	3	3	6
4	For care plan activities, some fields, e.g. "outcome", data cannot be entered and no value visible - should the label even appear? Only necessary fields to be displayed	3	2	5
5	Encounters with the same clinician at different time points are hidden (safety issue?)	3	2	5
6	Cannot expand "+2 more" on my patients screen	3	1	4
7	Range not indicated on Lab results chart	3	1	4
8	New patient submitted data not indicated on patient view (need to look through tasks and recognize yourself if anything is new)	3	1	4
9	No indication of who is part of a care team in the message view	3	1	4
10	No indication of what questionnaires are available on the system	2	2	4
11	Optional data entry fields are not clearly marked	2	2	4
12	There are no menu selection defaults	2	2	4
13	The system does not have an on-line spatial menu map	2	2	4
14	No way to easily add members of a care team for one patient	2	1	3
15	Top menu and side menu same when on dashboard (redundant?)	2	1	3
16	Title not visible on care plan page once saved	2	1	3
17	For CDS suggestions, some paragraphs can be quite long - display to user can be made easier by spacing out logical sentences	2	1	3

6.3.7 Flexibility and efficiency of use

The fulfilment of this heuristic is NOT APPLICABLE. No customizations/accelerators were made available to users apart from the patient data vital signs. The system has not catered for different user expertise or allowed for tailored frequent actions. No frequent actions could be saved to hotkeys, etc. This has not necessarily been a required design specification and not deemed to be necessary, based on the types of dialogs, etc.

However, for future reference the following issues could be considered:

7. Flexibility and efficiency of use		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	The system does not provide function keys	2	2	4
2	The system does not automatically enter leading zeros	2	2	4
3	Users do not have the option of either clicking on fields or using a keyboard shortcut	1	1	2
4	On menus, users do not have the option of either clicking directly on a menu item or using a keyboard shortcut	1	1	2
5	In dialog boxes, users do not have the option of either clicking directly on a dialog box option or using a keyboard shortcut	1	1	2

6.3.8 Aesthetic and minimalist design

This heuristic was largely satisfied as the design is quite aesthetic and, apart from the patient summary, most screens are quite minimalist. Specific usability issues identified include (order in terms of Severity and Criticality):

8. Aesthetic and minimalist design		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	There is too much information displayed on the screen	3	2	5
2	On the left navigation label "Patient Data" should be renamed as perhaps "Self-reported patient data" to make the distinction between patient data from other sources	2	1	3
3	Description for some activities are too long when creating an activity	1	2	3
4	There are many icons which are not conceptually distinct	1	1	2

6.3.9 Help users recognize, diagnose and recover from errors

This heuristic has been satisfied. Error messages where available give sufficient information of the issue and how the user is to recover from the error. However, there were minor instances where error messages are expected but not provided (see list below):

Specific usability issues identified include (order in terms of Severity and Criticality):

9. Help users recognize, diagnose, and recover from errors		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	In the Messages area, for a new message, if the addressee or referenced patient are incorrectly selected or typed in, an error message should appear to inform the user of this and that the message is not valid. The user only knows about this if they go into Sent box and see that their message had no addressee or patient reference	2	1	3
2	The system does not use sound to signal an error	1	2	3
3	Errors when creating goals, not clearly explained. "Unable to update goal" do not give reasons for errors	1	1	2
4	Encounters do not correctly organize by date and this is not clear as an issue	1	1	2

6.3.10 Help and documentation

This heuristic is unsatisfied. In the current version of the system, there is no online help on the system. The user manual is the only available documentation. Help for users on the system is currently missing and is an important feature to have. Users need to be able to access a guide on how to use the system and

how to do certain actions, in what order, e.g. how to create a care plan and what elements are mandatory, important or optional. The user needs to understand what the next steps are after creation and workflow. If they are stuck, a guide on how to resolve issues is needed.

Specific usability issues identified include (order in terms of Severity and Criticality):

10. Help and Documentation		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	No online help available	3	4	7
2	Data entry screens and dialog boxes do not have completion instructions	3	2	5
3	There is no explanatory information for menu item e.g BP management	3	2	5
4	The system does not have visible help function	3	2	5
5	There is no context-sensitive help	2	2	4
6	There is no memory aids for commands	1	1	2
7	There is no memory aids for commands	1	1	2
8	Need to indicate that “password” is password for all test users	1	1	2

6.3.11 Skills

This heuristic was largely satisfied as data was well presented and summary screens allowed users to quickly grasp a patient’s status. However, the system does not differentiate between novice and expert users since the target users are expected to have similar skill level.

Specific usability issues identified include (order in terms of Severity and Criticality):

11. Skills		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	Preempt next steps of user to inform logical order of data entry	3	4	7
2	Positioning of cursor where data entry is most likely	3	3	6
3	Function keys are not available and not deemed necessary in the system	2	2	4
4	Navigation operations are not easy to use	2	2	4
5	For novice users, there are not more screens	2	2	4
6	Unclear if double clicking on date allows new appointment to be made	1	1	2

6.3.12 Pleasurable and respectful interaction with the user

This heuristic was largely satisfied as it appeared that the system treated the user with respect and made most user interactions streamlined. The system satisfied this heuristic with minimal use of colour, allowing partial data entry.

Specific usability issues identified include (order in terms of Severity and Criticality):

12. Pleasurable and Respectful Interaction with the User		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	Care barriers icon in medical summary not intuitive and may be inappropriate	3	2	5
2	Care barriers icon in medical summary not intuitive and may be inappropriate	3	1	4
3	Side-bar and top menu messages icons are different	1	3	4
4	When going back from patient summary side bar enters from left when it should leave left	1	1	2
5	The system does not complete unambiguous partial input on a data entry field	1	1	2
6	It is not clear that you can pin a max of 4 vital signs	1	1	2
7	Not intuitive that the magnifying glass next to the care plan will open care plan	1	1	2
8	Users cannot turn off automatic color coding if necessary	0	0	0

6.3.13 Privacy

This heuristic was largely unsatisfied as all information was visible to any user of the system, whether a patient or practitioner and, without the ability to manage passwords, this presents a significant vulnerability.

Specific usability issues identified include (order in terms of Severity and Criticality):

13. Privacy		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	Can see all patients and practitioners regardless of role (potential privacy breach)	3	2	5
2	Clicking "search" immediately shows all patients (potential privacy breach)	3	2	5
3	On a few of instances, there was a delay in redirection to C3DP after login and I was directed to the authentication manager area. The authentication manager area should be inaccessible if redirection to C3DP is delayed or fails. Some other error message should be given.	3	2	5
4	Users can see unsent draft messages addressed to them on the dashboard	3	1	4
5	Terms of Service/Privacy policy take you to hidden dashboard instead of documents	2	1	3
6	Terms of Service/Privacy policy take you to hidden dashboard instead of documents	2	1	3
7	Access authorization rights could use explanation why they are needed	1	1	2
8	Access rights authorization opt-in vs opt-out	1	1	2

6.3.14 Accessibility

This heuristic was partially satisfied. While the system was overall quite easy to use, certain missing functionality and the lack on help resources reduced its accessibility.

Specific usability issues identified include (order in terms of Severity and Criticality):

14. Accessibility	Severity Rating	Frequency	Criticality
Usability Issue			
Appointments added via the activities calendar view cannot be saved	3	2	5
In terms of helping users avoid making mistakes, it is unclear in places how actions can be reversed, e.g. if I have added a care plan activity by mistake, do I select status "Cancelled"?	2	3	5
Cannot set up online appointments with patients	2	2	4
Not all functionality operable via a keyboard interface	2	2	4
Patient summary screen not explained in manual	2	1	3
Fields on goals not explained on site	2	1	3
Cannot tell what can be filtered on message page until after starting to type in search box	1	3	4
Restricted timeout period for the session. After a period of inactivity, the user should be warned of logout and logged out	1	2	3
It does not allow users to control time limits on their reading or interaction	0	0	0

6.3.15 Summary

The following table presents the distribution of % of usability errors, in each heuristic, based on a total 196 usability issues identified:

Summary on overall usability issues (total=196)	% to all errors
1. Visibility of System Status	13%
2. Match Between System and the Real World	19%
3. User Control and Freedom	7%
4. Consistency and Standards	20%
5. Help Users Recognize, Diagnose, and Recover From Errors	6%
6. Error Prevention	9%
7. Recognition Rather Than Recall	3%
8. Flexibility and and efficiency of use	2%
9. Aesthetic and Minimalist Design	2%
10. Help and Documentation	4%
11. Skills	3%
12. Pleasurable and Respectful Interaction with the User	4%
13. Privacy	4%
14. Accessibility	5%

6.4 Results – PEP Component

The following represents the results of the HE evaluation on the C3DP component. Every heuristic is discussed in terms of overall evaluation and specific usability issues are provided and ordered in terms of Severity and Criticality.

6.4.1 Visibility of system status

This heuristic has been partially satisfied, as the system status was largely evident, but some missing information and navigation problems reduced usability. What is potentially missing is clear order and instructions for the user to navigate the system and prioritise.

Specific usability issues identified include (order in terms of Severity and Criticality):

1. Visibility of System Status		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	Once navigated away from, notifications settings cannot be found in settings menu	3	3	6
2	Cannot return to previous page when clicking back from manage notifications page	3	3	6
3	Multipage questionnaires do not always show relations between pages	3	2	5
4	Questions which were visible remain hidden when choosing to edit questionnaire responses before submission	3	2	5
5	Previous BP observations visible on C3DP not visible on PEP	2	2	4
6	Active prescriptions from C3DP patient summary page do not appear in activities	2	1	3
7	Sent message from C3DP Test user does not appear in PEP	2	1	3

6.4.2 Match between system and the real world

This heuristic has been largely satisfied as much of the system is patient oriented, however some technical jargon and errors with 2-factor authentication exist.

Specific usability issues identified include (order in terms of Severity and Criticality):

2. Match Between System and the Real World		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	Questionnaire questions are often too long and complex	3	2	5
2	Technical jargon used in patient facing manual	3	2	5
3	Phone number in profile not connected to number in Account Settings	3	1	4
4	The system does not automatically enter leading or trailing spaces to align decimal points	2	2	4
5	The system does not automatically enter a dollar sign and decimal for monetary entries	2	2	4
6	The system does not automatically enter commas in numeric values greater than 9999	2	2	4
7	Factor Authentication SMS sender does not have meaningful name	2	1	3
8	No options for forgotten password reset on login screen	2	1	3
9	Code for 2 factor authentication not required when logging in when enabled	2	1	3

6.4.3 User control and freedom

This heuristic has been largely well-satisfied as many users are able to change their settings and modify responses to questionnaires at all points. However, some minor problems have been observed and need rectification.

Specific usability issues identified include (order in terms of Severity and Criticality):

3. User Control and Freedom		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	Users can only go back in a multipage questionnaire	3	2	5
2	Users cannot skip over to later questions	2	2	4
3	For the How are you Questionnaire, you cannot cancel the questionnaire you have started. While the user's partial questionnaire is not submitted, cancelling entirely is not an option	2	2	4
4	There is no Undo function	2	2	4
5	Profile setup needs to be better highlighted as an important step, and also which fields are important and how it potentially affects the system – timezones, etc.	1	2	3

6.4.4 Consistency and standards

This heuristic has been largely satisfied but regional settings are not picked up from the client browser.

Specific usability issues identified include (order in terms of Severity and Criticality):

4. Consistency and standards		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	Multipage questionnaires do not have a sequential page number	1	3	4
2	One point to highlight is the differing project logo colours, especially when different products will be used/seen by user groups and some consistency across need to be maintained	1	3	4
3	Use of tab key works but not reflected on the on-hover highlighting	1	3	4
4	Date in US format (photo upload)	1	2	3
5	Time not correctly pre-populated for client region (photo upload)	1	2	3
6	The system uses uppercase titles	1	2	3
7	For care plan activity types, nouns seem to be used. For consistency, "observation" can be used instead of "observe"	1	2	3

6.4.5 Error prevention

This heuristic has only been partially satisfied, as there is no validation on dates and uploaded files, as well as problems with CSS loading in certain cases. However, overall the system provided error messages for most out of range values and sought confirmation for actions, such as deletion.

Specific usability issues identified include (order in terms of Severity and Criticality):

5. Error prevention		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	No verification of photo file formats during upload	3	3	6
2	Can post date observation recordings	3	3	6
3	Care plan appearing to have been updated by Anna Karlsson when in fact modified by Patient Test User	3	2	5
4	Date of Birth for user can be later than today's date (not prepopulated from C3DP)	3	1	4
5	Care plan loads without styling if clicked from settings pages	2	2	4

6.4.6 Recognition rather than recall

This heuristic was well-satisfied as all information was readily available through the dashboard with no issues related to data retention or retrieval. We provide some points for future consideration in system redesign:

1. In the care plan, with potentially many activities, appointments, messages, etc., the lists can potentially be long and ways to group for easier reading should be considered.
2. Under Settings left vertical navigation, the higher-level menu in caps are only slightly different to the sub-menu items in colour and font size. Increasing the distinction would improve navigation and recognition.
3. Regarding the display of only necessary and dependent fields, for blood pressure entry, e.g. "Details" provides additional fields that cannot be edited or initially provided.
4. Optional data entry fields could be more clearly marked.

6.4.7 Flexibility and efficiency of use

This heuristic has been largely satisfied. However, the system does not seem to differentiate between novice and skilled users and there are no shortcuts provided for frequent actions. The keyboard can be used and tab keys to navigate data entry screens, however, there is no visual cue as to where the focus is. The user needs some familiarization with the system in order to access information quickly, as well as getting used to the format in which information is provided.

Specific usability issues identified include (order in terms of Severity and Criticality):

7. Flexibility and efficiency of use		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	The system does not provide function keys	2	2	4
2	The system does not automatically enter leading zeros	2	2	4
3	The system does not use a type-ahead strategy, and the menu items do not have mnemonic codes	1	1	2
4	Users do not have the option of either clicking on fields or using a keyboard shortcut	1	1	2
5	On data entry screens, users do not have the option of either clicking directly on a field or using a keyboard shortcut	1	1	2
6	On menus, users do not have the option of either clicking directly on a menu item or using a keyboard shortcut	1	1	2
7	In dialog boxes, users do not have the option of either clicking directly on a dialog box option or using a keyboard shortcut	1	1	2

6.4.8 Aesthetic and minimalist design

This heuristic was largely satisfied as the design was quite aesthetic and, apart from one questionnaire bug, all screens displayed as expected. The design is also minimalistic.

Specific usability issues identified include (order in terms of Severity and Criticality):

8. Aesthetic and minimalist design		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	Newly visible questions on questionnaires appear above the questions which make them appear (out of order)	3	2	5
2	Questionnaire and Observe tags have the same colour	1	1	2

6.4.9 Help users recognize, diagnose, and recover from errors

The system meets this heuristic as error messages are displayed close to where the error has occurred and provides adequate resolution advice. However, the system could in the future use sound to signal an error.

6.4.10 Help and documentation

This heuristic was largely unsatisfied as no help or documentation online was provided and sections of the user manual were missing. Help and documentation of steps to carry out user tasks are not available on the system and memory aids are also not available. These are crucial to support the user in using the system. The clarity and usability of the help system could not be assessed. Additionally, not all the functionality described in the manual could be tested on the current system. Video conferencing, some messaging and the use of connected devices could not be tested.

Specific usability issues identified include (order in terms of Severity and Criticality):

	10. Help and Documentation	Severity Rating	Frequency	Criticality
No	Usability Issue			
1	No online help or manual	3	4	7
2	No sections on tracking and settings pages in PEP manual	3	2	5
3	Missing text in section 3 of manual	3	1	4
4	Multipage questionnaires do not have navigation instructions	2	2	4
5	The system does not have visible help function	2	2	4
6	There is no context-sensitive help	2	2	4
7	There is no memory aids for commands	1	1	2

6.4.11 Skills

This heuristic was largely satisfied as data was presented well and summary screens allow users to quickly grasp their activity status. However, the system does not differentiate between novice and expert users and the target users are expected to have a minimum ICT skill level. The system supports and enhances the user skills, with some areas needed to be addressed.

Specific usability issues identified include (order in terms of Severity and Criticality):

	11. Skills	Severity Rating	Frequency	Criticality
No	Usability Issue			
1	For novice users, there are no more screens	2	2	4
2	Language translations need to be available to cater for the regional users	2	4	6
3	In a screen or dialog box, the cursor is not positioned in the field users are most likely to need to provide support	2	3	5
4	The anticipation and prompting of possible next activities are lacking	2	3	5
5	For novice users, there are no more screens. 2, 20%	2	2	4

6.4.12 Pleasurable and respectful interaction with the user

This heuristic was largely satisfied, although missing functionality prevented this heuristic from being fully evaluated.

Specific usability issues identified include (order in terms of Severity and Criticality):

12. Pleasurable and Respectful Interaction with the User		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	No way to create messages in PEP	3	3	6
2	No option to add feedback on any items	3	3	6
3	No communication with care team functionality available in PEP	3	3	6
4	The system should help the user to protect personal or private information- belonging to the user or the his/her clients	1	2	3
5	Users cannot turn off automatic color coding if necessary	1	1	2
6	The system does not complete unambiguous partial input on a data entry field	1	1	2

6.4.13 Privacy

This heuristic has been fully satisfied as data visibility was well protected and the process of adding caregiver accounts was well thought out. However, considering the General Data Protection Regulation (GDPR) and privacy, confidentiality and security requirement, there is a clear need to explicitly add “terms of use” and “privacy policy”.

6.4.14 Accessibility

This heuristic was partially satisfied. While the system was overall quite easy to use, certain missing functionality prevented this heuristic from being evaluated fully. While specific accessibility measures within the system itself are unknown, the system has good accessibility features, such as logout of sessions after an amount of time. Warning before logging out could not be tested.

Specific usability issues identified include (order in terms of Severity and Criticality):

14. Accessibility		Severity Rating	Frequency	Criticality
No	Usability Issue			
1	For reverting actions, for questionnaire, such as the “How are you questionnaire”, a questionnaire cannot be completely cancelled. The user can choose to not submit it, but cannot remove it from their account	3	2	5
2	When using the keyboard for navigation and data entry, where the focus is at any time is not always clear	2	3	5
3	Not all functionality operable via a keyboard interface	2	2	4
4	It does not allow users to control time limits on their reading or interaction	2	2	4
5	For meal photos, editing existing entries to add a description caused an error message	2	1	3
6	Cannot test video appointment functionality as no option to add appointment	1	1	2
7	No sensor device to test functionality	1	1	2

6.4.15 Summary

The following table presents the distribution of % of usability errors, in each heuristic, based on a total 67 usability issues identified:

Summary on overall usability issues (total=67)	% to all errors
1. Visibility of System Status	10%
2. Match Between System and the Real World	13%
3. User Control and Freedom	7%
4. Consistency and Standards	10%
5. Help Users Recognize, Diagnose, and Recover From Errors	7%
6. Error Prevention	0%
7. Recognition Rather Than Recall	10%
8. Flexibility and efficiency of use	3%
9. Aesthetic and Minimalist Design	0%
10. Help and Documentation	10%
11. Skills	7%
12. Pleasurable and Respectful Interaction with the User	9%
13. Privacy	0%
14. Accessibility	10%

7 DISCUSSION

7.1 Component testing

Regarding component testing (for the task 9.2 reported in D9.3) and following a discussion with all involved technical partners, it was decided to:

- Check and merge IEEE 829 document templates by focusing on the most relevant points with respect to current state of the C3-Cloud project. The standard specifies the format of these documents but don't stipulate whether they must all be produced, nor include any criteria regarding adequate content for these documents. These were a matter of judgment outside the purview of the standard.
- Not to utilize the EuroRec quality-labeling Tool in D9.3 due to workload and timeline constraints.
- PCPDP and C3DP were separately listed during the requirements phase but later they have been merged into one as C3DP.

7.2 Application testing

Regarding application testing it was decided to:

- Use the Delphi Method instead of the ISO Standard Square, due to available resources and experience of the INSERM team. INSERM adopted a “Refined-Delphi” approach for the assessment criteria of the C3-Cloud integrated application. The Pilot Application Requirements (PAR), use cases and application testing criteria have been used to define which requirements have to be tested through application and usability testing in task 9.2.
- Considering received comments, we can say that most of NO responses to Application testing questionnaire are due to “not finding the option”, “not knowing”, “not been informed about it”, “Not clear how to work through the system”, “Not obvious what needs to be done”, “More time needed”. On another hand there were feedbacks that were vague to interpret, for example “Depends on which materials are presented”, “I have not stopped”. Participants need to be more specific about the problem they faced.
- For the “product reaction cards” method, the 118 words list included positive words (e.g. Innovative, engaging etc.), together with negatives words (e.g. Frustrating, Time consuming etc.). The participants were asked to pick the words that best describe the C3-Cloud platform or how using the product made them feel. We limit the choice number to 5 words, as commonly used in such approach. At the end of the study, a scoring was made to identify the most commonly words by the participants to describe the system.

7.3 Usability testing

Recommendations made for further C3DP development (see Appendix 6, Table 1)

- It is recommended that technical partners who develop the C3DP platform further investigate the usability criteria leading to the following results:
 - rated lower than in the mean;
 - having a STD larger than 2;
 - having a non-response rate of more than 15%.

The defined cut-off points (mean, STD and non-response rate) were selected based on convenience to highlight some of the most important items. However, software developers are advised to also regard all other items in their efforts to improve usability.

Recommendations made for further PEP development: (see Appendix 6, Table 2)

- It is recommended that technical partners in charge of developing the PEP platform could further investigate the usability criteria leading to the following results:
 - rated lower than 5.9 in the mean;
 - having a STD larger than 2.3;
 - having a non-response rate of more than 20%.

The defined cut-off points (mean, STD and non-response rate) were selected based on convenience to highlight some of the most important items. However, software developers are advised to also regard all other items in their efforts to improve usability. It is pointed out here that the non-response rate was larger than 20% for 55 of the total of 72 items. The main anticipated reason for the rather high non-response rate is the limited scope of activities performed during the test sessions. Test participants may not have experienced certain aspects of the software component during the test sessions and thus were not able to respond to a number of items. It is expected that this issue will be resolved when carrying out the QUIS with actual patients during the technology trial.

7.4 Remarks and current limitations of the test and evaluation

Interim evaluation:

- The usability evaluation is an interim evaluation. The technology trial has not started yet and thus the testing with actual users is yet to be carried out. Real life experience with actual MDT members and patients in three pilot sites will be obtained during the technology trial (initiated in M31) and evaluated in T9.3.
- Test user patients felt that the system has great potential but they did not feel that they would want to use it in its current format: Thus, patients aged 65+ over may struggle using it and recommend that system usage needs to be much simpler.

Considering updates at the current state of the project:

- PARs reviews involving both clinicians and technical partners
- Update of the Traceability Matrix table

Participants recruitment:

- Number of participants during the Usability and Application testing questions was different from the DoA specification due to Pilot sites difficulties in recruiting at this stage participants that are fluent in English. English fluency was obligatory for the testing since the C3-Cloud platforms were not translated to Spanish and Swedish by that time.
- For the evaluation studies of C3-Cloud, the balance between men and women aimed to be preserved during patient recruitment in all three pilot sites. The multi-disciplinary teams composed of health and social caregivers should also have a balanced distribution.
- Although in D9.2, it was stated that national ethics application is not required for the application testing and heuristic evaluation, we believe that local ethical approval is required as we are dealing with human participants and also this will be important for any publication of results from these evaluation studies.
- The local ethics committee to ensure appropriateness of patients and data processing assessed ethical factors. For INSERM, the two questionnaires (MDTs and Patients) were reviewed and none of them raised ethical issues.

Pilot sites feedback:

- Mock-up reporting feedback for C3DP: The report of the C3DP from the pilot sites has not been collected in a structured way, as it has happened with PEP. Some of the feedbacks have been reported as formal reports but most of them have been informally reported, in telco meetings, plenary meetings... The C3DP has been and still is a very complex and challenging goal of the project. It requires continuous updating according to the feedback from the pilot sites, in an iterative manner in close collaboration with the C3DP developers.
- Mock-up reporting review feedback for PEP: The patients who participated in the feedback of the PEP mock-ups in the 3 sites, were highly empowered patients and are perhaps more adept at critical review and are more healthcare savvy than the 'average' patient.

Layer 2 and 3 evaluation:

The early, small scale usability testing (QUIS7) identified a number of areas for usability improvement on both C3-Cloud platforms (C3DP and PEP). These have been flagged to technical partners to investigate in terms of which areas need improvement or should be further investigated. While the QUIS7 questionnaire serves well to identify areas for usability improvement, it is important to recognize that it does not clarify why users rated specific usability items as negative or positive. The results therefore can be used as a discussion basis with technical partners and selected users to identify what exactly can be improved to increase system usability. This is supported by the 'unstructured feedback' presented in this deliverable. This unstructured feedback is used to stimulate discussions between the technical partners and end users such as members of the clinical reference group (CRG). Thus, this early evaluation report does claim to be complete, but can be used as a resource for further platform improvements.

Overall, referring to participant responses, application and usability testing questionnaires were too long and did not allow the issues that testers encountered to be clearly defined. Testers felt that it would have been more efficient to have questions into the walkthrough document. This would help to better understand what information they can expect to find and where it can be found on the platform.

There was an issue for some test users that the platforms were not in their native language, despite having language facilitators readily available.

Regarding the mock-up review, even though formally it has been encompassed for both C3-Cloud platforms, we are still working on them, learning and developing things. One of the lessons learnt during the development of the platforms, is that C3DP is a huge and quite complex undertaking. C3DP acts as a workflow engine to facilitate organisation, planning, and monitoring of integrated care activities, and enables coordination and collaboration among the multidisciplinary care team members and the patient through the PEP. It has been and is still a challenging objective. That is why a Clinical Reference Group (CRG) has been set up. This group involves clinicians from the three sites who aim to support, guide and provide recommendations from an end-user perspective, for the benefit of the software developers.

8 CONCLUSION AND FUTURE PLANS

The D9.3 reports the current results of the testing of the C3-Cloud components. This testing includes the Component Testing and Usability Studies. The Component Testing have been conducted on the 6 C3-Cloud components and based on functional and non-functional test cases described above. Results are reported into a "Test Plan" and "Test results report" and are discussed in terms of how to improve the components.

The Usability studies includes an Application testing to evaluate how people interact with the software through questionnaires, a Mock-up reporting to evaluate the design of the system, and a Heuristic Evaluation based on a storyboard guiding through the usage of the Patient Empowerment Platform (PEP) and the Care and Cure Delivery Platform (C3DP).

All these tests, results and reports are described in the deliverable and associated details provided in Appendices, see section 10.

The next steps, following the test and evaluation report for C3-Cloud Components can be summarized as follow:

- The test report in this deliverable serves to support technical partners resolving detected issues and improving the usability of the platforms. Furthermore, the user training manuals

and the approach to train users for platform usage will be adapted and improved using the feedback received from the test sessions. This to ensure high quality training (manuals) for the technology trial participants. The QUIS7 questionnaire will serve also as a test run for conducting this questionnaire with a larger user group during the technology trial in layer 3 of the evaluation.

- Possibility to perform the component testing with EuroRec quality labeling Tool for upcoming WP9 deliverable (i.e. during the technology trial)
- Integrate the questions into the walkthrough document so that participants can answer the questions as they are testing the relevant sections on the C3-Cloud platforms.
- Have the C3-Cloud platforms versions readily available in participants native languages (Swedish and Spanish)
- Perform the UTAUT questionnaire for an evaluation of the user technology (C3-Cloud platforms) acceptance.
- At last, one might wonder if the different number of participants for the pilot sites could influence the result in a skewed way. With respect to application and usability, the performed testing is an early testing to adapt the system where needed and to get first insight. Statistical evaluation or adjustment can be planned in future steps from the whole setup.

9 REFERENCES

- [D3.2] C3-Cloud Deliverable 3.2 - Requirements Specification of the C3-Cloud Architecture
- [D3.3] C3-Cloud Deliverable 3.3 – Conceptual Design of the C3-Cloud Architecture
- [D6.1] C3-Cloud Deliverable 6.1 – C3-Cloud Technical Interoperability Implementation Guidelines and Open Source Toolkits
- [D6.2] C3-Cloud Deliverable 6.2 – C3-Cloud Semantic Interoperability Platform
- [D6.3] C3-Cloud Deliverable 6.3 – Open Source Privacy and Security Toolkits for the C3-Cloud Architecture
- [D7.2] C3-Cloud Deliverable 7.2 – Clinical Decision Support Modules for Personalised Care Plan Development and Execution
- [D7.3] C3-Cloud Deliverable 7.3 – Personalised Care Plan Development Platform
- [D8.1] C3-Cloud Deliverable 8.1 – Use Cases and Requirement Specifications of the Pilot Application

10 APPENDICES

There are 9 appendices in this deliverable:

Appendix 1.	Component Test Plans
Appendix 2.	Component Test Results
Appendix 3.	Application Testing by MDTs
Appendix 4.	Application Testing by Patients
Appendix 5.	QUIS7 Usability Testing [Month 25]
Appendix 6.	QUIS7 Usability Testing Results [Month 25]
Appendix 7.	Mock-up Feedback for C3DPMock-up Feedback for PEP
Appendix 8.	Revised PARs List

10.1 Appendix 1 Component Test Plans

This section consists of 6 test plans for the following components:

10.1.1.	C3DP
10.1.2.	PEP
10.1.3.	CDSM
10.1.4.	TIS
10.1.5.	SIS
10.1.6.	SPS

10.1.1 C3DP Test Plan



C3-Cloud

“A Federated Collaborative Care Cure Cloud Architecture for Addressing the Needs of Multi-morbidity and Managing Poly-pharmacy”

PRIORITY Objective H2020-PHC-25-2015 - Advanced ICT systems and services for integrated care

Coordinated Care and Cure Delivery Platform (C3DP) Component Test Plan and Design

Work Package: WP9 Evaluation and Assessment

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v0.1	25-05-2018	Template update	MEDIXINE	Task 9.2
v0.2	31-05-2018	Complete test plan and design for C3DP	SRDC	Task 9.2

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1. INTRODUCTION

1.1 Background

This current test plan is for the component testing of the C3-Cloud Coordinated Care and Cure Delivery Platform (C3DP) component.

1.2 Objectives of the Test Plan

The test plan objectives are:

- define the scope of what will be tested;
- specify the approach taken to testing;
- specify how the testing results will be evaluated.

1.3 Objectives of the Component Test

Check and verify that the implemented component functionalities meet the specified requirements. The technical requirements were first created in tasks T3.2 and T3.3 and have been updated a few times as part of task T3.4.

1.4 References

Standards and deliverables:

- IEEE Std 829-1998, Standard for Software Test Documentation Deliverables
- D3.2 “Requirements Specification of the C3-Cloud Architecture”
- D3.3 “Conceptual Design of the C3-Cloud Architecture”
- D8.1 “Use Cases and Requirement Specifications of the Pilot Application”
- D9.1 “Functional and Non-Functional Testing Criteria for C3-Cloud Components”

Within the scope of Task 3.4, the Pilot Application Requirements (PARs) of D8.1 and the Requirements Traceability Matrix (RTM) of D3.2 and D3.3 have been reviewed and updated by May 2018.

2 TEST ITEMS

ID	Name	Type
C3DP-UI	C3DP Web Application	Software
FHIR-REPO	C3-Cloud Secure FHIR Repository	Software
C3DP-EVENT	C3DP Event API	Software

Table 1: Item to be tested

3 FEATURES TO BE TESTED

The following test cases have been identified based on use cases.

ID	Description	Covered use case(s)
T-C3DP-1	Create care plan	PCPDP-1: Create Care Plan PCPDP-2: Add new Care Plan from a Core Care Plan PCPDP-3: Define new Care Plan PCPDP-6: Reconcile Care Plans for Multiple

		Conditions C3DP-15: Access Educational Material C3DP-10: Share Care Plan with Care Team Members PCPDP-9: Export Care Plan
T-C3DP-2	Review care plan dashboard	C3DP-14: Care Plan Dashboard
T-C3DP-3	Manage care team	C3DP-2: Invite a Care Team Member C3DP-3: Add Care Team Member C3DP-5: Discover Care Team C3DP-4: Remove Care Team Member
T-C3DP-4	Review patient provided observations	C3DP-11: Record Patient Observations C3DP-14: Care Plan Dashboard
T-C3DP-5	Update care plan	PCPDP-7: Find Care Plan PCPDP-4: Update Existing Care Plan PCPDP-8: Tag Care Plan Items
T-C3DP-6	Safe messaging with professionals	C3DP-7: Manage Messages C3DP-6: Send Message to Care Team Member(s)
T-C3DP-7	Safe messaging with patient	C3DP-7: Manage Messages C3DP-6: Send Message to Care Team Member(s)

4 FEATURES NOT TO BE TESTED

Use case	Comments
C3DP-1: Close Care Plan	Designed but not implemented yet.
C3DP-8: Invite Care Team Members to a Virtual Care Review Meeting C3DP-9: Organize Virtual Care Review Meeting	Designed but not implemented yet.
PCPDP-5: Review Care Plan for Reconciliation	Obsolete.
PCPDP-10: Import Care Plan	Obsolete.
C3DP-12: Associate Supportive Content	Obsolete.
C3DP-13: Monitor Change	Obsolete.

5 APPROACH

This section outlines the global approach of the component testing.

5.1 Criticality of features to be tested

ID	Description	Criticality level
T-C3DP-1	Create care plan	Level 4

T-C3DP-2	Review care plan dashboard	Level 2
T-C3DP-3	Manage care team	Level 3
T-C3DP-4	Review patient provided observations	Level 2
T-C3DP-5	Update care plan	Level 4
T-C3DP-6	Safe messaging with professionals	Level 1
T-C3DP-7	Safe messaging with patient	Level 1

Common levels of criticality are:

- *Level 0: No criticality evaluated, suppletive or non-effective functions;*
- *Level 1: Low criticality, tolerability of certain inadequate system functions and tools;*
- *Level 2: Heightened criticality, scheduled downtime is acceptable;*
- *Level 3: High criticality, failure will cause degraded mode to numerous systems;*
- *Level 4: Highest criticality, system functions, failure will cause unrecoverable and critical errors to numerous systems.*

5.2 Test level and technique

ID	Test level	Techniques involved in tests
T-C3DP-1	Integration	Data-driven testing, expert review.
T-C3DP-2	Integration	Data-driven testing, expert review.
T-C3DP-3	Component	Conformance testing, expert reviewing.
T-C3DP-4	Integration	Data-driven testing, expert review.
T-C3DP-5	Integration	Data-driven testing, expert review.
T-C3DP-6	Component	Conformance testing, expert reviewing.
T-C3DP-7	Integration	Data-driven testing, expert review.

5.3 Priority of execution of tests

Tests depending on existing patient records from local care systems provided via TIS should be done first in the following order: T-C3DP-1, T-C3DP-2, T-C3DP-5. Then tests depending on interactions with the PEP should be done in the following order: T-C3DP-4, T-C3DP-7. Tests that do not depend on external components (T-C3DP-3, T-C3DP-6) can be done after T-C3DP-1 in any order.

5.4 Monitoring test advancement and metrics

Metrics used in all data-driven and expert reviewing tests (T-C3DP-1, T-C3DP-2, T-C3DP-4, T-C3DP-5, T-C3DP-7) are precision, recall and f-measure. Metrics used in Conformance tests (T-C3DP-3, T-C3DP-6) are rates of failure.

5.5 Management of defects

SRDC development team is notified of all defects found in testing. If defect is caused by data created by TIS, CDSM and PEP; WARWICK, CAMBIO, INSERM and MEDIXINE development teams will also be notified. The test continues with the next item. Fallback test patient and care team are used if needed.

5.6 Test tools used

Postman. Custom Node.js scripts. Gitlab Issue Tracker. Asana.

6 ITEM PASS/FAIL CRITERIA

ID	Criteria
C3DP-UI	The reference content for testing is displayed as expected and stored in the FHIR-REPO.
FHIR-REPO	No errors logged during integration requests and storage. The resulting data at either end is the expected when the reference content for testing is used.
C3DP-EVENT	No errors logged during integration and conformance testing. All subscribed parties are notified as expected.

6.1 Evaluation Team

Evaluation Team of the C3DP Component tests will be composed by at least one representative from:

- SRDC as development team,
- WARWICK, CAMBIO, INSERM and MEDIXINE as development team of linked component

Members of the test team (see 10.1) can be members of the evaluation team. Additional people from their respective partners might be involved in the evaluation team.

6.2 Evaluation Process

Evaluating the results of the testing in order to make a decision about whether the test item has passed or failed. The stages are:

1. **Summarise Testing Results** – This deals with taking all incidents and tracing them back to the requirements they affected.
2. **Make Acceptance Decision** – A decision is then taken as to whether to accept or reject the item.

6.3 Requirements Traceability Matrix

The matching of C3DP test cases with the functional requirements in the C3-Cloud Requirements Traceability Matrix (RTM) is provided below. The complete RTM is provided along with the main deliverable D9.3.

ID	Description	Covered Requirements from Traceability matrix
T-C3DP-1	Create care plan	PCPDP-FR-1, PCPDP-FR-2, PCPDP-FR-3, PCPDP-FR-4, PCPDP-FR-5, PCPDP-FR-6, PCPDP-FR-7, PCPDP-FR-9, PCPDP-FR-10, PCPDP-FR-11, PCPDP-FR-12, PCPDP-FR-14, PCPDP-FR-15, PCPDP-FR-16, PCPDP-FR-17, PCPDP-FR-19, PCPDP-FR-20, PCPDP-FR-23, PCPDP-FR-24, PCPDP-FR-28, PCPDP-FR-33, PCPDP-FR-36, PCPDP-FR-41, C3DP-FR-4, C3DP-FR-5, C3DP-FR-6, C3DP-FR-7, C3DP-FR-8, C3DP-FR-9, C3DP-FR-13, C3DP-FR-24, C3DP-FR-25, C3DP-FR-31, C3DP-FR-39, C3DP-FR-20

T-C3DP-2	Review care plan dashboard	C3DP-FR-37
T-C3DP-3	Manage care team	PCPDP-FR-11, PCPDP-FR-12, PCPDP-FR-13, PCPDP-FR-14, C3DP-FR-4, C3DP-FR-5, C3DP-FR-6, C3DP-FR-7, C3DP-FR-8, C3DP-FR-9, C3DP-FR-10, C3DP-FR-11, C3DP-FR-12, C3DP-FR-13, C3DP-FR-20
T-C3DP-4	Review patient provided observations	C3DP-FR-26, C3DP-FR-27, C3DP-FR-20
T-C3DP-5	Update care plan	PCPDP-FR-18, PCPDP-FR-21, PCPDP-FR-22, PCPDP-FR-23, PCPDP-FR-28, PCPDP-FR-37, PCPDP-FR-38, PCPDP-FR-41, C3DP-FR-24, C3DP-FR-25, C3DP-FR-33, C3DP-FR-20
T-C3DP-6	Safe messaging with professionals	PCPDP-FR-30, C3DP-FR-14, C3DP-FR-15, C3DP-FR-16, C3DP-FR-17, C3DP-FR-18, C3DP-FR-19, C3DP-FR-20
T-C3DP-7	Safe messaging with patient	PCPDP-FR-30, C3DP-FR-14, C3DP-FR-15, C3DP-FR-16, C3DP-FR-17, C3DP-FR-18, C3DP-FR-19

7 TEST PLAN PASS/FAIL CRITERIA

No critical or medium level incidents shall occur in any of the C3DP items.

8 SUSPENSION CRITERIA AND RESUMPTION REQUIREMENTS

C3DP component testing should be interrupted if:

- Communication with FHIR-REPO fails.
- Login failure into the C3DP.
- Integration with TIS, PEP and CDSM fails in the relevant integration tests.
- Any other critical failure that prevents planned tests to proceed.

Testing can resume when critical incidents have been resolved.

9 TEST DELIVERABLES

The testing will use and produce the following output:

1. **Test Plan and Design** – The overall plan and design for testing.
2. **Test Results** – The results of running the tests (summary reports, logs, incident reports).

10 TESTING TASKS

10.1 Roles and Responsibilities

Role	Name	Entity
Test Manager	Gokce B. Laleci Erturkmen	SRDC
Development Tester	Bunyamin Sarigul Ezelsu Simsek	SRDC

Expert	Mustafa Yuksel	SRDC
MEDIXINE Expert	Pontus Lindman	MEDIXINE
CAMBIO Expert	Rong Chen	CAMBIO
WARWICK Expert	Lei Zhao	WARWICK
INSERM Expert	Jacques Bouaud	INSERM

10.2 Test preparation

This subsection identifies all tasks required for test preparation.

Task description	Person Responsible
Setting up testing environment	SRDC, MEDIXINE, CAMBIO, WARWICK, INSERM
Creating reference content for testing	SRDC, Pilot sites
Adding testing reference content to testing environment	SRDC
Creating user accounts for testing	SRDC, MEDIXINE

10.3 Test execution

The testers follow the provided manuals during testing.

ID	Description	Test Steps
T-C3DP-1	Create care plan	#a. View patient list #b. Search and select a patient #c. Review medical summary #d. Create a care plan #e. Create a care team (optional) #f. Add new goals (either manually or by accepting and adapting the personalized recommendations from the clinical decision support services) #g. Add new Activity (either manually or by accepting and adapting the personalized recommendations from the clinical decision support services) #h. Add new education material. #i. Save and share care plan Care Team Members #j. Export Care Plan as a PDF document
T-C3DP-2	Review care plan dashboard	#a. View patient list #b. Review medical summary of a

		<p>selected patient</p> <p>#c. Review your activities in your calendar</p>
T-C3DP-3	Manage care team	<p>#a. View patient list</p> <p>#b. Search and select a patient</p> <p>#c. Open the care plan of a specific patient</p> <p>#c. View the care team associated with this care plan</p> <p>#d. Invite a Care Team Member</p> <p>#e. Logout and log-in as the invited care team member</p> <p>#f. View the care team membership invitation from your messages and accept it</p> <p>#g. Logout and log-in as the care team manager</p> <p>#h. View the care team of the care plan of the selected patient, where the newly invited member is added to the care team</p> <p>#h. Remove a care team member</p>
T-C3DP-4	Review patient provided observations	<p>Alternative A</p> <p>#a. View patient list</p> <p>#b. Search and select a patient</p> <p>#c. Review medical summary of a selected patient</p> <p>#d. Observe patient provided observations such as blood pressure measurements</p> <p>Alternative B</p> <p>#a. View patient list</p> <p>#b. Search and select a patient</p> <p>#c. Review care plan of a selected patient</p> <p>#d. Observe patient provided observations in the related activities such as blood pressure measurements, assigned questionnaires, daily meal photo observations</p> <p>#e. Observe patient provided observations in a single dashboard by</p>

		<p>opening the Patient Data View</p> <p>Alternative C</p> <p>#a. Check your notifications</p> <p>#b. Upon seeing a notification such as “Observation Created” or “Patient filled a questionnaire”, click on it.</p> <p>#c. Review patient provided data</p>
T-C3DP-5	Update care plan	<p>#a. View patient list</p> <p>#b. Search and select a patient</p> <p>#c. Review care plan of a selected patient</p> <p>#d. Review and update the existing goals (e.g. update their status)</p> <p>#e. Add notes to the existing goals (to tag them to be reviewed by care team members)</p> <p>#f. Review and update the existing activities (e.g. update their status)</p> <p>#g. Add progress notes to the existing goals (to tag them to be reviewed by care team members)</p>
T-C3DP-6	Safe messaging with professionals	<p>Alternative A</p> <p>#a. Open Messages Module</p> <p>#b. Click Care Team Members tab</p> <p>#c. Open a received message received from a care team member</p> <p>#d. Reply to this message</p> <p>Alternative B</p> <p>#a. Open Messages Module</p> <p>#b. Click ‘New Message’</p> <p>#c. Write the name of a care team member, and select him/her as the recipient</p> <p>#d. Write a new message and send it.</p>
T-C3DP-7	Safe messaging with patient	<p>Alternative A</p> <p>#a. Open Messages Module</p> <p>#b. Click Patients tab</p> <p>#c. Open a received message received from a patient</p>

		<p>#d. Reply to this message</p> <p>Alternative B</p> <p>#a. Open Messages Module</p> <p>#b. Click ‘New Message’</p> <p>#c. Write the name of one of your patients, and select him/her as the recipient</p> <p>#d. Write a new message and send it.</p>
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11 ENVIRONMENTAL NEEDS

Testing environment requirements:

- Deployed environment with C3DP, PEP, TIS, SIS, CDSM, SPS application components and the C3-Cloud FHIR repository.

10.1.2 PEP Test Plan



C3-Cloud

“A Federated Collaborative Care Cure Cloud Architecture for Addressing the Needs of Multi-morbidity and Managing Poly-pharmacy”

PRIORITY Objective H2020-PHC-25-2015 - Advanced ICT systems and services for integrated care

Patient Empowerment Platform (PEP) Component Test Plan

Work Package: WP9 Evaluation and Assessment

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1. INTRODUCTION

1.1. Background

This current test plan is for the component testing of the C3-Cloud Patient Empowerment Platform (PEP) component.

PEP depends heavily on the integration with C3DP as C3DP creates and manages the integrated care plan, which is the source for much of the essential functionality in PEP. C3DP is also the recipient of the data collected from patients.

1.2. Objectives of the Test Plan

The test plan objectives are:

- define the scope of what will be tested;
- specify the approach taken to testing;
- specify how the testing results will be evaluated.

1.3. Objectives of the Component Test

Check and verify that the implemented component functionalities meet the specified requirements. The technical requirements were first created in tasks T3.2 and T3.3 and have been updated as part of task T3.4.

1.4. References

Standards

- IEEE Std 829-1998, Standard for Software Test Documentation Deliverables
- D3.2 “Requirements Specification of the C3-Cloud Architecture”
- D3.3 “Conceptual Design of the C3-Cloud Architecture”
- D9.1 “Functional and Non-Functional Testing Criteria for C3-Cloud Components”

TODO: how to reference the updated specification (revised PARs and updated UC and technical requirements).

2. TEST ITEMS

ID	Name	Type	Comments
PEP	PEP	Software	Patient Empowerment Platform component
PEP-GW	PEP Gateway	Software	Providing a single interface to Patient Empowerment Platform
PEP-UI	PEP User interface	Software	A web application based on Medixine Suite for patient access users to view their care plan and the related goals and activities, to enter and view their follow-up data (including measurements and questionnaires), to communicate with their

			MDT team, and to access educational material.
--	--	--	---

Table 1: Item to be tested

3. FEATURES TO BE TESTED

ID	Name	Use case	Notes/Comments
T-PEP-1	Synchronize MDT	PEP-4.1: Manage care teams and health professionals	Part of 7.4 integration work (FHIR Practitioner, CareTeam and member synchronization)
T-PEP-2	Synchronize patient	PEP-4.2: Create patient record for individual patient	Part of 7.4 integration work (FHIR Patient synchronization)
T-PEP-3	Synchronize careplan	PEP-1.1: Publish active care plan to patient PEP-1.6: Update care plan	Part of 7.4 integration work (FHIR CarePlan synchronization)
T-PEP-4	View careplan	PEP-1.2: View active care plan PEP-5.1: Access self-management material	Display of the synchronized care plan based on FHIR Care plan created in C3DP.
T-PEP-5	Complete questionnaires	PEP-2.2: Complete patient questionnaires according the timings defined in care plan	Note! Limited to C3-Cloud questionnaire details and C3DP integration testing. Standard Medixine Suite Questionnaires functionality not included in testing.
T-PEP-6	Synchronize observations	PEP-2.3: Notify connected systems of new and changed patient-observed data	
T-PEP-7	Communicate with MDT	PEP-3.1: Communicate via Safe messaging	Note! Limited to the current capabilities of C3DP (service instead of individual as target for new message from patient).

4. FEATURES NOT TO BE TESTED

Use case	Comments
PEP-1.7: Mark active care plan as finished	Not sure if C3DP supports this (event)? Nor if it is needed at least in the trials? Should be revisited.
PEP-2.1: Measure and collect patient observation data according to the timings	Medixine Suite standard functionality used (already tested).

defined in care plan	
PEP-1.4: Flag care plan treatment interventions and the corresponding goals as achieved PEP-1.5: Flag care plan treatment interventions and the corresponding goals as not achieved	Note! No relevant PAR and specification under review.
PEP-4.3: Assign patient to health professional's care team PEP-4.4: Invite patient to access own patient workspace PEP-4.5: Authenticate patient access user to use PEP functionality PEP-4.7: Invite personal caregiver to access related patient's workspace PEP-4.8: Access selected patient's workspace	Related to local patient authentication. Finalized in T8.3 deployment phase for each pilot application.

5. APPROACH

5.1. Test level and technique

ID	Test level	Techniques involved in tests
T-PEP-1	Integration	Data-driven testing, expert review.
T-PEP-2	Integration	Data-driven testing, expert review.
T-PEP-3	Integration	Data-driven testing, expert review.
T-PEP-4	Component	Conformance testing, expert reviewing.
T-PEP-5	Integration	Data-driven testing, expert review.
T-PEP-6	Integration	Data-driven testing, expert review.
T-PEP-7	Integration	Data-driven testing, expert review.

5.2. Priority of execution of tests

Tests reading data from C3DP/FHIR should be done first to verify that data flows correctly into PEP, then User Interface tests to verify that data is displayed correctly and finally test that collected data is transferred correctly back to C3DP/FHIR.

5.3. Monitoring test advancement and metrics

Number of deviations from expected results.

5.4. Management of defects

Medixine development team is notified of all defects found in testing. If defect is caused by data created by C3DP, SRDC development is also notified. The test continues with the next item. Fallback test patient and care team is used if needed.

5.5. Test tools used

Medixine VSTS. Postman. SQL Management tools.

6. ITEM PASS/FAIL CRITERIA

ID	Criteria
PEP-GW	No errors logged during integration requests and storage. The resulting data at either end is the expected when the reference content for testing is used.
PEP-UI	The reference content for testing is displayed as expected.

6.1. Evaluation Team

Evaluation Team of the PEP Component tests will be composed by at least one representative from:

- Medixine as development team,
- SRDC as development team of linked component,
- Project Management

Members of the test team (see 10.1) can be members of the evaluation team. Additional people from their respective partners might be involved in the evaluation team.

6.2. Evaluation Process

Evaluating the results of the testing in order to make a decision about whether the test item has passed or failed. The stages are:

1. **Summarise Testing Results** – This deals with taking all Incidents and tracing them back to the requirements they affected.
2. **Make Acceptance Decision** – A decision is then taken as to whether to accept or reject the item. In practice there will be a lot of pressure to accept and item. Therefore, it is useful to have a third category of Limited Acceptance, which means that the system is accepted with provisos.

6.3. Requirements Traceability Matrix

This subsection specifies what tools will be used to track:

- Incidents to the Test Cases that produced them.
- Test Cases Acceptance Criteria for which Test Cases were developed.
- Acceptance Criteria back to the Requirements from which they were extracted.

This results in you being able to trace an Incident back to the Requirement and Business Scenario it effects. A useful tool for these matrices is a straightforward set of spreadsheets.

7. TEST PLAN PASS/FAIL CRITERIA

No critical or medium level Incidents.

8. SUSPENSION CRITERIA AND RESUMPTION REQUIREMENTS

PEP component testing should be interrupted if:

- Integration with C3DP fails critically when updating the care plan in C3DP.
- Login failure into the PEP.
- Any other critical failure that prevents planned tests to proceed.

Testing can resume when critical incidents have been resolved.

9. TEST DELIVERABLES

The testing will use and produce the following output:

1. **Test Plan** – The overall plan for testing
2. **Test Design Specification** – The acceptance criteria, what need to be tested (see chapters 3, 6 and 7 for details).
3. **Test Data and Test Cases Specification** – Data used for testing and the values input and results expected from tests (based on the reference content for testing).
4. **Test Results** – The results of running the tests (summary reports, logs, incident reports).

10. TESTING TASKS

10.1. Roles and Responsibilities

Role	Name	Entity
Test Manager	Otto Teinonen	Medixine
Development Tester	Jan Dahlin Kimmo Korhonen	Medixine
Expert	Pontus Lindman	Medixine
SRDC	Mustafa Yuksel	SRDC

10.2. Test preparation

This subsection identifies all tasks required for test preparation.

Task description	Person Responsible
Setting up testing environment	Medixine, SRDC
Creating reference content for testing	Pilot sites
Adding testing reference content to testing environment	Medixine, SRDC
Creating user accounts for testing	Medixine, SRDC

10.3. Test execution

The testers follow the provided manuals during testing.

ID	Item	Trigger
T-PEP-1	PEP-4.1: Manage care teams and health professionals	Create care team in C3DP/FHIR and trigger relevant events to PEP.
T-PEP-2	PEP-4.2: Create patient record for individual patient	Create patients in C3DP/FHIR and trigger relevant events to PEP.
T-PEP-3	PEP-1.1: Publish active care plan to patient PEP-1.6: Update care plan	Create care plan in C3DP/FHIR and trigger relevant events to PEP. Update care plan in C3DP/FHIR and trigger relevant events to PEP.
T-PEP-4	PEP-1.2: View active care plan PEP-5.1: Access self-management material	Login using created patient credentials and open care plan.
T-PEP-5	PEP-2.2: Complete patient questionnaires according the timings defined in care plan	Login using created patient credentials and fill in the questionnaire assigned to the care plan.
T-PEP-6	PEP-2.3: Notify connected systems of new and changed patient-observed data	Login using created patient credentials, fill in the questionnaire assigned to the care plan and manually create observations for activities in the care plan.
T-PEP-7	PEP-3.1: Communicate via Safe messaging	#a. Create message to patient in C3DP and trigger relevant events to PEP. #b. Login using created patient credentials, open the received message and reply to it. #c. Login using created patient credentials, open messaging and create a new message.

11. ENVIRONMENTAL NEEDS

Testing environment requirements:

- Deployed environment with PEP and C3DP application components and the C3-Cloud FHIR repository.

10.1.3 CDSM Test Plan



C3-Cloud

“A Federated Collaborative Care Cure Cloud Architecture for Addressing the Needs of Multi-morbidity and Managing Poly-pharmacy”

PRIORITY Objective H2020-PHC-25-2015 - Advanced ICT systems and services for integrated care

Clinical Decision Support Module (CDSM) Component Test Plan

Work Package: WP9 Evaluation and Assessment
Due Date: 30 June 2018
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Project Dates: Project Start Date: 01 May 2016
 Project End Date: 30 April 2020
 Project Duration: 48 months
Document Leader: WARWICK

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Dissemination Level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	
EU-RES	Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)	
EU-CON	Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)	
EU-SEC	Classified Information: SECRET UE (Commission Decision 2005/444/EC)	

Document History:

Version	Date	Changes	From	Review
v0.1	06-06-2018	First draft of test plan and design	WARWICK	Task 9.2
v0.2	15-06-2018	Complete version	WARWICK	Task 9.2

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1 INTRODUCTION

1.1 Background

This current test plan is for the component testing of the C3-Cloud Clinical Decision Support Module (CDSM) component.

1.2 Objectives of the Test Plan

The test plan objectives are:

- define the scope of what will be tested;
- specify the approach taken to testing;
- specify how the testing results will be evaluated.

1.3 Objectives of the Component Test

Check and verify that the implemented component functionalities meet the specified requirements. The technical requirements were first created in tasks T3.2 and T3.3 and have been updated in T7.2 and maintained as part of task T3.4.

1.4 References

Standards and deliverables:

- IEEE Std 829-1998, Standard for Software Test Documentation Deliverables
- D3.2 “Requirements Specification of the C3-Cloud Architecture”
- D3.3 “Conceptual Design of the C3-Cloud Architecture”
- D7.2 “Clinical Decision Support Modules for Personalised Care Plan Development and Execution”
- D8.1 “Use Cases and Requirement Specifications of the Pilot Application”
- D9.1 “Functional and Non-Functional Testing Criteria for C3-Cloud Components”

Within the scope of Task 3.4, the Pilot Application Requirements (PARs) of D8.1 and the Requirements Traceability Matrix (RTM) of D3.2 and D3.3 have been reviewed and updated by May 2018.

2 TEST ITEMS

ID	Name	Type
CDSM-GUIDELINES	GDL2 Guidelines	Software
CDSM-INTERACTIONS	Drug Interactions Service	Software

Table 1: Item to be tested

3 FEATURES TO BE TESTED

The following test cases have been identified based on use cases.

ID	Description	Covered use case(s)
T-CDSM-1	CDS-Hooks API test	CDSM-3: Care Plan Goal and Activity Suggestions CDSM-6: Guideline Reconciliations

T-CDSM-2	DM2, RF, HF and Depression guideline rules test	CDSM-3: Care Plan Goal and Activity Suggestions
T-CDSM-3	Reconciliation test	CDSM-6: Guideline Reconciliations
T-CDSM-4	Drug-drug interaction test	CDSM-4: Drug/Drug and Drug/Disease Interactions
T-CDSM-5	Drug-disease interaction test	CDSM-4: Drug/Drug and Drug/Disease Interactions

4 FEATURES NOT TO BE TESTED

Use case	Comments
CDSM-1: Create or Update Knowledge Modules	Obsolete. The project uses Cambio GDL2 CDS platform which has built-in support for knowledge module management.
CDSM-2: Validate Knowledge Modules	Obsolete. The project uses Cambio GDL2 editor which has built-in support for rule testing.
CDSM-5: Risk Assessment	Obsolete. The only identified risk assessment tool is QRISK2. The project reuses an implementation of QRISK2 provided by Cambio.

5 APPROACH

This section outlines the global approach of the component testing.

5.1 Criticality of features to be tested

ID	Description	Criticality level
T-CDSM-1	CDS-Hooks API test	Level 3
T-CDSM-2	DM2, RF, HF and Depression guideline rules test	Level 3
T-CDSM-3	Reconciliation test	Level 3
T-CDSM-4	Drug-drug interaction test	Level 3
T-CDSM-5	Drug-disease interaction test	Level 3

Common levels of criticality are:

- *Level 0: No criticality evaluated, suppletive or non-effective functions;*
- *Level 1: Low criticality, tolerability of certain inadequate system functions and tools;*
- *Level 2: Heightened criticality, scheduled downtime is acceptable;*
- *Level 3: High criticality, failure will cause degraded mode to numerous systems;*
- *Level 4: Highest criticality, system functions, failure will cause unrecoverable and critical errors to numerous systems.*

5.2 Test level and technique

ID	Test level	Techniques involved in tests
T-CDSM-1	Integration	Data-driven testing, expert review.
T-CDSM-2	Component	Conformance testing, expert review.
T-CDSM-3	Component	Conformance testing, expert review.
T-CDSM-4	Integration	Data-driven testing, expert review.
T-CDSM-5	Integration	Data-driven testing, expert review.

5.3 Priority of execution of tests

T-CDSM-1/T-CDSM-2/T-CDSM-3 and T-CDSM-4/T-CDSM-5 are independent and can be executed in parallel. The priority should be given according to the following order: T-CDSM-1, T-CDSM-2, T-CDSM-3. T-CDSM-4 and T-CDSM-5 can be executed in parallel.

5.4 Monitoring test advancement and metrics

Metrics used in all data-driven and expert review tests (T-CDSM-1, T-CDSM-4, T-CDSM-5) are precision, recall and f-measure. Metrics used in Conformance tests (T-CDSM-2, T-CDSM-3) are rates of failure.

5.5 Management of defects

CAMBIO and WARWICK development teams are notified of all defects found in testing. If a defect is caused by data created by C3DP, SRDC team will also be notified. The test will be re-executed with corrected data.

5.6 Test tools used

Postman, Cambio GDL2 Editor, Gitlab Issue Tracker.

6 ITEM PASS/FAIL CRITERIA

ID	Criteria
CDSM-GUIDELINES	Correct CDS-Hooks cards are generated based on the CDSM technical specification.
CDSM-INTERACTIONS	No errors logged during integration testing. Drug interaction information is received and displayed properly in C3DP.

6.1 Evaluation Team

Evaluation Team of the CDSM Component tests will be composed by at least one representative from:

- WARWICK as development team of HF and Depression guidelines
- CAMBIO as development team of DM2 guidelines and CDS engine
- INSERM as development team of RF guidelines
- SRDC as development team of C3DP

Members of the test team (see 10.1) can be members of the evaluation team. Additional people from their respective partners might be involved in the evaluation team.

6.2 Evaluation Process

Evaluating the results of the testing in order to make a decision about whether the test item has passed or failed. The stages are:

3. **Summarise Testing Results** – This deals with taking all incidents and tracing them back to the requirements they affected.
4. **Make Acceptance Decision** – A decision is then taken as to whether to accept or reject the item.

6.3 Requirements Traceability Matrix

The matching of C3DP test cases with the functional requirements in the C3-Cloud Requirements Traceability Matrix (RTM) is provided below. The complete RTM is provided along with the main deliverable D9.3.

ID	Description	Covered Requirements from Traceability matrix
T-CDSM-1	CDS-Hooks API test	CDSM-FR-6
T-CDSM-2	DM2, RF, HF and Depression guideline rules test	CDSM-FR-7
T-CDSM-3	Reconciliation test	CDSM-FR-10
T-CDSM-4	Drug-drug interaction test	CDSM-FR-8
T-CDSM-5	Drug-disease interaction test	CDSM-FR-8

7 TEST PLAN PASS/FAIL CRITERIA

No critical or medium level incidents shall occur in any of the CDSM items.

8 SUSPENSION CRITERIA AND RESUMPTION REQUIREMENTS

CDSM component testing should be interrupted if:

- Deployment of guidelines to the CDS engine fails
- Communication with C3DP fails
- Any other critical failure that prevents planned tests to proceed

Testing can resume when critical incidents have been resolved.

9 TEST DELIVERABLES

The testing will use and produce the following output:

1. **Test Plan and Design** – The overall plan and design for testing.
2. **Test Results** – The results of running the tests (summary reports, logs, incident reports).

10 TESTING TASKS

10.1 Roles and Responsibilities

Role	Name	Entity
Test Manager	Lei Zhao	WARWICK
CAMBIO Expert	Rong Chen	CAMBIO
INSERM Expert	Jacques Bouaud	INSERM
SRDC Expert	Mustafa Yuksel	SRDC

The test involves the following roles and responsibilities:

- The **Test Manager** is in charge of the Test Plan execution and the supervision of all related activities.
- The **Development Tester** is responsible of all code-related test actions.
- The **Expert** roles review and validate test results.

10.2 Test preparation

This subsection identifies all tasks required for test preparation.

Task description	Person Responsible
Setting up testing environment	WARWICK, CAMBIO, INSERM, SRDC
Deploying guidelines to GDL2 CDS engine	CAMBIO
Creating test patient data for testing	SRDC, CAMBIO
Adding test patient data to testing environment	SRDC

10.3 Test execution

The testers follow the provided manuals during testing.

ID	Description	Test Steps
T-CDSM-1	CDS-Hooks API test	#a. Deploy a guideline to GDL2 CDS engine #b. C3DP sends an HTTP POST request with prefetched FHIR resources to GDL2 CDS engine #c. GDL2 engine accepts the request and executes the guideline #d. GDL2 engine returns 200 OK with an array of CDS-Hooks cards #e. C3DP accepts the response and validates the cards
T-CDSM-2	DM2, RF, HF and Depression guideline rules test	#a. Open GDL2 editor #b. Import FHIR profiles and guidelines into the editor #c. On the execution tab choose input conditions

		#d. Execute cards #e. Verify the results of execution
T-CDSM-3	Reconciliation test	#a. Open GDL2 editor #b. Import FHIR profiles and guidelines into the editor #c. On the execution tab choose input conditions #d. Execute cards #e. Verify the results of execution
T-CDSM-4	Drug-drug interaction test	#a. C3DP sends an HTTP GET request with drugs as target parameter to the drug interaction service #b. The drug interaction service accepts the request and executes the query #c. The drug interaction service returns 200 OK with drug-drug interaction data #d. C3DP accepts the response and displays the interaction information #e. Verify the displayed information
T-CDSM-5	Drug-disease interaction test	#a. C3DP sends an HTTP GET request with diseases as target parameter to the drug interaction service #b. The drug interaction service accepts the request and executes the query #c. The drug interaction service returns 200 OK with drug-disease interaction data #d. C3DP accepts the response and displays the interaction information #e. Verify the displayed information

11 ENVIRONMENTAL NEEDS

Testing environment requirements:

- Deployed environment with C3DP, C3DP FHIR repository, GDL2 editor and GDL2 CDS engine.

10.1.4 TIS Test Plan



C3-Cloud

“A Federated Collaborative Care Cure Cloud Architecture for Addressing the Needs of Multi-morbidity and Managing Poly-pharmacy”

PRIORITY Objective H2020-PHC-25-2015 - Advanced ICT systems and services for integrated care

Technical Interoperability Suite (TIS) Component Test Plan

Work Package: WP9 Evaluation and Assessment
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Project Dates: Project Start Date: 01 May 2016
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 Project Duration: 48 months
Document Leader: WARWICK

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Dissemination Level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	
EU-RES	Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)	
EU-CON	Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)	
EU-SEC	Classified Information: SECRET UE (Commission Decision 2005/444/EC)	

Document History:

Version	Date	Changes	From	Review
v0.1	05-06-2018	Test plan and design draft	WARWICK	Task 9.2
v0.2	15-06-2018	Complete version	WARWICK	Task 9.2

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1. INTRODUCTION

1.1. Background

This current test plan is for the component testing of the C3-Cloud Technical Interoperability Suite (TIS) component.

1.2. Objectives of the Test Plan

The test plan objectives are:

- define the scope of what will be tested;
- specify the approach taken to testing;
- specify how the testing results will be evaluated.

1.3. Objectives of the Component Test

Check and verify that the implemented component functionalities meet the specified requirements. The technical requirements were first created in tasks T3.2 and T3.3 and have been updated in T6.1 and maintained as part of task T3.4.

1.4. References

Standards and deliverables:

- IEEE Std 829-1998, Standard for Software Test Documentation Deliverables
- D3.2 “Requirements Specification of the C3-Cloud Architecture”
- D3.3 “Conceptual Design of the C3-Cloud Architecture”
- D6.1 “Technical Interoperability Implementation Guidelines and Open Source Toolkits”
- D8.1 “Use Cases and Requirement Specifications of the Pilot Application”
- D9.1 “Functional and Non-Functional Testing Criteria for C3-Cloud Components”

Within the scope of Task 3.4, the Pilot Application Requirements (PARs) of D8.1 and the Requirements Traceability Matrix (RTM) of D3.2 and D3.3 have been reviewed and updated by May 2018.

2. TEST ITEMS

ID	Name	Type
TIS-UI	TIS Web Application	Software
TIS-SERVER	TIS Server	Software

Table 1: Item to be tested

3. FEATURES TO BE TESTED

The following test cases have been identified based on use cases.

ID	Description	Covered use case(s)
T-TIS-1	Register Patient	TIS-7: Register Patient
T-TIS-2	Schedule data import task	TIS-6: Import Patient Data
T-TIS-3	Receive data import requests from C3DP	TIS-6: Import Patient Data

T-TIS-4	Import from Osakidetza CDA service	TIS-6: Import Patient Data
T-TIS-5	Import from RJH Open services	TIS-6: Import Patient Data
T-TIS-6	Import from SWFT CSV files	TIS-6: Import Patient Data

4. FEATURES NOT TO BE TESTED

Use case	Comments
TIS-2: Share Care Plan	Designed but not implemented yet.
TIS-1: Query Patient Data	Obsolete.
TIS-3: Push Patient Observations	Obsolete.
TIS-5: Push Patient Data	Obsolete.

5. APPROACH

This section outlines the global approach of the component testing.

5.1. Criticality of features to be tested

ID	Description	Criticality level
T-TIS-1	Register Patient	Level 3
T-TIS-2	Schedule data import task	Level 3
T-TIS-3	Receive data import requests from C3DP	Level 3
T-TIS-4	Import from Osakidetza CDA service	Level 3
T-TIS-5	Import from RJH Open services	Level 3
T-TIS-6	Import from SWFT CSV files	Level 3

Common levels of criticality are:

- *Level 0: No criticality evaluated, suppletive or non-effective functions;*
- *Level 1: Low criticality, tolerability of certain inadequate system functions and tools;*
- *Level 2: Heightened criticality, scheduled downtime is acceptable;*
- *Level 3: High criticality, failure will cause degraded mode to numerous systems;*
- *Level 4: Highest criticality, system functions, failure will cause unrecoverable and critical errors to numerous systems.*

5.2. Test level and technique

ID	Test level	Techniques involved in tests
T-TIS-1	Component	Conformance testing, expert review.
T-TIS-2	Component	Conformance testing, expert review.
T-TIS-3	Integration	Conformance testing, expert review.

T-TIS-4	Integration	Data-driven testing, expert review.
T-TIS-5	Integration	Data-driven testing, expert review.
T-TIS-6	Integration	Data-driven testing, expert review.

5.3. Priority of execution of tests

Tests should be executed in the following order: T-TIS-1, T-TIS-2/T-TIS-3, T-TIS-4/T-TIS-5/T-TIS-6. T-TIS-2 and T-TIS-3 are independent and can be executed in parallel. T-TIS-4, T-TIS-5 and T-TIS-6 are independent and can be executed in parallel.

5.4. Monitoring test advancement and metrics

Metrics used in all data-driven and expert review tests (T-TIS-4, T-TIS-5, T-TIS-6) are precision, recall and f-measure. Metrics used in Conformance tests (T-TIS-1, T-TIS-2, T-TIS-3) are rates of failure.

5.5. Management of defects

WARWICK development team is notified of all defects found in testing. If a defect is caused by data created by local care system or SIS, local care system (OSAKI/RJH/SWFT) and INSERM teams will also be notified. The test will be re-executed with corrected data.

5.6. Test tools used

Postman, JUnit/Spring, Gitlab Issue Tracker.

6. ITEM PASS/FAIL CRITERIA

ID	Criteria
TIS-UI	The reference content for testing is displayed as expected and stored in the TIS-SERVER.
TIS-SERVER	No errors logged during integration testing. Patient data in the format of FHIR resources are saved properly in the C3DP FHIR repository.

6.1. Evaluation Team

Evaluation Team of the TIS Component tests will be composed by at least one representative from:

- WARWICK as development team,
- INSERM, SRDC, OSAKI, RJH, and SWFT as development team of linked components

Members of the test team (see 10.1) can be members of the evaluation team. Additional people from their respective partners might be involved in the evaluation team.

6.2. Evaluation Process

Evaluating the results of the testing in order to make a decision about whether the test item has passed or failed. The stages are:

1. **Summarise Testing Results** – This deals with taking all incidents and tracing them back to the requirements they affected.

2. **Make Acceptance Decision** – A decision is then taken as to whether to accept or reject the item.

6.3. Requirements Traceability Matrix

The matching of TIS test cases with the functional requirements in the C3-Cloud Requirements Traceability Matrix (RTM) is provided below. The complete RTM is provided along with the main deliverable D9.3.

ID	Description	Covered Requirements from Traceability matrix
T-TIS-1	Register Patient	TIS-FR-21
T-TIS-2	Schedule data import task	TIS-FR-1
T-TIS-3	Receive data import requests from C3DP	TIS-FR-3
T-TIS-4	Import from Osakidetza CDA service	TIS-FR-1, TIS-FR-6, TIS-FR-8, TIS-FR-15, TIS-FR-18, TIS-FR-22
T-TIS-5	Import from RJH Open services	TIS-FR-1, TIS-FR-6, TIS-FR-8, TIS-FR-15, TIS-FR-18, TIS-FR-22
T-TIS-6	Import from SWFT CSV files	TIS-FR-1, TIS-FR-6, TIS-FR-8, TIS-FR-15, TIS-FR-18, TIS-FR-22

7. TEST PLAN PASS/FAIL CRITERIA

No critical or medium level incidents shall occur in any of the TIS items.

8. SUSPENSION CRITERIA AND RESUMPTION REQUIREMENTS

TIS component testing should be interrupted if:

- Communication with local care system fails
- Communication with SIS fails
- Communication with C3DP FHIR repository fails
- Any other critical failure that prevents planned tests to proceed

Testing can resume when critical incidents have been resolved.

9. TEST DELIVERABLES

The testing will use and produce the following output:

1. **Test Plan and Design** – The overall plan and design for testing.
2. **Test Results** – The results of running the tests (summary reports, logs, incident reports).

10. TESTING TASKS

10.1. Roles and Responsibilities

Role	Name	Entity
Test Manager	Lei Zhao	WARWICK

SRDC Expert	Mustafa Yuksel	SRDC
INSERM Expert	Eric Sadou	INSERM
OSAKI Expert	Nico González López	OSAKI
RJH Expert	Matias Wurschmidt-Wang	RJH
SWFT Expert	Marie Beach	SWFT

The test involves the following roles and responsibilities:

- The **Test Manager** is in charge of the Test Plan execution and the supervision of all related activities.
- The **Development Tester** is responsible of all code-related test actions.
- The **Expert** roles review and validate test results.

10.2. Test preparation

This subsection identifies all tasks required for test preparation.

Task description	Person Responsible
Setting up testing environment	WARWICK, SRDC, INSERM, OSAKI, RJH, SWFT
Creating test patient data for testing	OSAKI, RJH, SWFT
Adding test patient data to testing environment	OSAKI, RJH, SWFT, WARWICK

10.3. Test execution

The testers follow the provided manuals during testing.

ID	Description	Test Steps
T-TIS-1	Register Patient	#a. Add new patient #b. Input patient id and study id #c. Save patient #d. View patient list
T-TIS-2	Schedule data import task	#a. View task list #b. Select a task #c. Input schedule #d. Select patients #e. Submit the task #f. View running task list
T-TIS-3	Receive data import requests from C3DP	#a. C3DP sends an HTTP POST request #b. Accept the request and return 200 OK #c. Execute the task #d. View task execution log

T-TIS-4	Import from Osakidetza CDA service	# a. Retrieve the task “Osakidetza CDA Service” # b. Execute the task # c. View task execution log # d. Review data in C3DP FHIR repository
T-TIS-5	Import from RJH Open services	# a. Retrieve the task “RJH Open Services” # b. Execute the task # c. View task execution log # d. Review data in C3DP FHIR repository
T-TIS-6	Import from SWFT CSV files	# a. Retrieve the task “SWFT CSV Files” # b. Execute the task # c. View task execution log # d. Review data in C3DP FHIR repository

11. ENVIRONMENTAL NEEDS

Testing environment requirements:

- Deployed environment with TIS, SIS, SPS, C3DP FHIR repository and local care systems.

10.1.5 SIS Test Plan



C3-Cloud

“A Federated Collaborative Care Cure Cloud Architecture for Addressing the Needs of Multi-morbidity and Managing Poly-pharmacy”

PRIORITY Objective H2020-PHC-25-2015 - Advanced ICT systems and services for integrated care

Semantic Interoperability Suite (SIS) Component Test Plan

Work Package: WP9 Evaluation and Assessment
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Dissemination Level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	
EU-RES	Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)	
EU-CON	Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)	
EU-SEC	Classified Information: SECRET UE (Commission Decision 2005/444/EC)	

Document History:

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V0.1	01-06-2018	Component Test Plan template	Medixine	T9.2 partners
V0.2	08-06-2018	Rework of the outline, detailed examples at each point	INSERM	INSERM

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1 INTRODUCTION

1.1. Background

This current test plan is about Semantic Interoperability Suite testing as a component of the C3-Cloud project.

The existence of dependencies and usage links between Semantic Interoperability Suite and others project components makes the tests of SIS to be done after those on which it depends and before those that depend on it.

Component tests that must be carried out before SIS test:

- Technical Interoperability Suite

Component tests that must be carried out after SIS test:

- Technical Interoperability Suite
- Personalised Care Plan Development Platform
- Coordinated Care & Cure Delivery Platform
- Patient Empowerment Platform

1.2. Objectives of the Test Plan

Semantic Interoperability Suite test plan objectives are:

- define the scope of what will be tested;
- specify the approach taken to testing;
- specify how the testing results will be evaluated.

1.3. Objectives of the Component Test

Objectives of SIS testing are to check and verify that the implemented component functionalities meet the specified requirements. The technical requirements were first created in tasks T3.2 and T3.3 and have been updated as part of task T3.4. Our focus will be in:

- checking that the functionality that is delivered works in use cases;
- checking that all functionality required for use cases has been delivered;
- checking that the delivered functionality works to specification.

1.4. References

Standards

- IEEE Std 829-1998, Standard for Software Test Documentation

Deliverables

D3.2 “Requirements Specification of the C3-Cloud Architecture”
 D3.3 “Conceptual Design of the C3-Cloud Architecture”
 D9.1 “Functional and Non-Functional Testing Criteria for C3-Cloud Components”
 D6.2 “Semantic Interoperability Suite Platform”
 Spreadsheet with requirements update process from Task 3.4
 Results from the Pilot Application Requirements from Task 3.4

2 TEST ITEMS

ID	Name	Type	Comments
SIS	Semantic Interoperability Services	Software	Provide semantic mapping of exchanged information in the project
SIS -TS	Terminology Service	Software	Provide terminological mappings
SIS -SM	Structural Mapper	Software	Provide Structural (metadata) mappings

3 FEATURES TO BE TESTED

SIS-1': Retrieve semantic mapping corresponding to the input coded value

SIS-2': Retrieve FHIR resource corresponding to the input local medical data

SIS-3': Create new terminology mapping

SIS-4': Register new terminology definition

ID	Use case being Tested	Notes/Comments
T-SIS-1'	SIS-1': Retrieve semantic mapping corresponding to the input coded value	Perform mapping from one terminology to another
T-SIS-2'	SIS-2': Retrieve FHIR resource corresponding to the input local medical data	Convert local data to C3-Cloud FHIR format
T-SIS-3'	SIS-3': Create new terminology mapping	Register a new mapping
T-SIS-4'	SIS-4': Register new terminology definition	Register a new terminology definition

4 FEATURES NOT TO BE TESTED

Not applicable for the SIS

5 APPROACH

The global approach of the test is explained in the following subsections:

5.1 Criticality of features to be tested

Table below defines the criticality of each main features to be tested.

ID	Criticality level	Comments
T- SIS-1'	3 (High criticality)	High criticality, failure will cause degraded mode to numerous

		systems
T-SIS-2'	3 (High criticality)	High criticality, failure will cause degraded mode to numerous systems
T-SIS-3'	1 (Low criticality)	Low criticality, tolerability of certain inadequate system functions and tools
T-SIS-4'	1 (Low criticality)	Low criticality, tolerability of certain inadequate system functions and tools

5.2 Test level and technique

ID	Test level	Techniques involved in tests	Test level
T- SIS-1'	Integration	Data-driven testing, expert review.	Integration
T-SIS-2'	Integration	Data-driven testing, expert review.	Integration
T-SIS-3'	Component	Data-driven testing, expert review.	Component
T-SIS-4'	Component	Conformance testing, expert reviewing.	Component

5.3 Priority of execution of tests

Not applicable for the SIS. Use cases are independent from each other.

5.4 Management of defects

INSERM development team is notified of all defects found in testing. If defect is related to data created by TIS, Warwick development is also notified.

ID	Defect management	Associated roles
T- SIS-1'	If defect occurred due to an incorrect mapping reported by expert, failure of mapping attempt will be reported. Current test is aborted.	Pilot Site Experts, Development Team
T- SIS-2'	If defect occurred due to an incorrect mapping reported by expert, failure of mapping attempt will be reported. Current test is aborted.	Pilot Site Experts, Development Team
T-SIS-3'	Development team will be notified	Pilot Site Experts,

		Development Team
T-SIS-4'	Development team will be notified	Pilot Site Experts, Development Team

5.5 Test tools used

The Postman tool was used.

6 ITEM PASS/FAIL CRITERIA

ID	Criteria
SIS	Item pass if the rate of validated mappings is equal or above the threshold on each feature and if no error was triggered if new mapping definition.
SIS -TS	Item pass if the rate of validated mappings is equal or above the threshold on each feature and if no error was triggered if new mapping definition.
SIS -SM	Item pass if the rate of validated mappings is equal or above the threshold on each feature and if no error was triggered if new mapping definition.

6.1 Evaluation Team

Evaluation Team of the SIS Test is composed by at least one representative from:

- INSERM as development team,
- SRDC and Warwick as development team of linked components
- Pilot Sites

6.2 Evaluation Process

Evaluating the results of the testing in order to make a decision about whether the test item has passed or failed. The stages are:

1. **Summarise Testing Results** – This deals with taking all incidents and tracing them back to the requirements they affected.
2. **Make Acceptance Decision** – A decision is then taken as to whether to accept or reject the item.

6.3 Requirements Traceability Matrix

The matching of SIS test cases with the functional requirements in the C3-Cloud Requirements Traceability Matrix (RTM) is provided below. The complete RTM is provided along with the main deliverable D9.3.

ID	Description	Corresponding requirements in the matrix
T- SIS-1'	SIS-1': Retrieve semantic mapping corresponding to the input coded value	SIS-SIR-1, SIS-NFR-1, SIS-NFR-2,

T-SIS-2'	SIS-2': Retrieve FHIR resource corresponding to the input local medical data	SIS-FR-1', SIS-FR-4', SIS-NFR-1, SIS-NFR-2,
T-SIS-3'	SIS-3': Create new terminology mapping	SIS-FR-8, SIS-UIR-2, SIS-NFR-1,
T-SIS-4'	SIS-4': Register new terminology definition	SIS-FR-8, SIS-NFR-1,

C3-Cloud Traceability Matrix will be used here. Interaction with test tool (automatic or manual) has to be determined.

7 TEST PLAN PASS/FAIL CRITERIA

No critical or medium level incidents shall occur in any of the SIS items.

8 SUSPENSION CRITERIA AND RESUMPTION REQUIREMENTS

Testing of Semantic Interoperability Suite should be paused immediately if either system experiences login issues or failure in any basic CRUD (Create, Read, Update and Delete) actions, or in external component communication (like Technical Interoperability Suite).

9 TEST DELIVERABLES

The Semantic Interoperability Suite will use and produce 2 documents:

3. **Test Plan and Design** – The overall plan and design for testing.
4. **Test Results** – The results of running the tests (summary reports, logs, incident reports).

10 TESTING TASKS

10.1 Roles and Responsibilities

Table below describes roles and responsibilities of people involved in the test.

Role	Name	Entity	Contact
Test Manager	Lamine Traore	Inserm	lamine.traore@inserm.fr
Development Tester	Mikael Dusene & Eric Sadou	Inserm	mikaeldusenne@gmail.com eric.sadou@gmail.com
Inserm Expert	Eric Sadou	Inserm	eric.sadou@gmail.com
Warwick representative	Lei Zhao	Warwick	lei.Zhao@warwick.ac.uk
SRDC representative	Mustafa Yuksel	SRDC	mustafa@srdc.com.tr
Pilot site representative	Matias	RJH	matias.wurschmidt-wang@regionjh.se

SIS Test Plan involves the following roles and responsibilities:

- The **Test Manager** is in charge of the Test Plan execution and the supervision of all related activities.
- The **Development Tester** is responsible of all code-related test actions.
- The **Expert** roles, both from Inserm who develop SIS and from pilot sites, are consulted the validate terminological semantic mappings.

10.2 Test preparation

Task description	Person Responsible
Setting up testing environment	INSERM
Creating reference content for testing	INSERM
Adding testing reference content to testing environment	INSERM

10.3 Test execution

ID	Description	Steps
T-SIS-1'	SIS 1':Retrieve semantic mapping corresponding to the input coded value	Access the demo webpage at http://cispro.chu-rouen.fr/c3-cloud/ Fill the form Launch the post request
T-SIS-2'	SIS-2': Retrieve FHIR resource corresponding to the input local medical data	Launch Postman Launch REST request collection
T-SIS-3'	SIS-3': Create new terminology mapping	Launch Postman Launch REST request collection
T-SIS-4'	SIS-4': Register new terminology definition	Launch the script

10.4 Schedule

The test preparation (10.2) was done on 1st June and the test execution (10.3) tasks took place in 7th June 2018.

11 ENVIRONMENTAL NEEDS

SIS has to be implemented on physical server. No software dependencies has been identified.

12 STAFFING AND TRAINING NEEDS

All actors involved in the SIS component testing have a good professional knowledge of manipulated items.

13 RISKS AND CONTINGENCIES

ID	Risk description	Impact (weak, average, strong)	Probabili ty	Contingencies
	Mapping failure (T-SIS-1', T-SIS-2', T-SIS-3' or T-SIS-4' aborted). This will result SIS become inoperative.	strong	Low	All C3-Cloud top level components may become unusable.
	Mapping accuracy is rejected (T-SIS-1', T-SIS-2', T-SIS-3' or T-SIS-4' failed)	strong	Low	Possible lot of precision or information between local systems and C3-Cloud top level components. Results might be false.

10.1.6 SPS Test Plan



C3-Cloud

“A Federated Collaborative Care Cure Cloud Architecture for Addressing the Needs of Multi-morbidity and Managing Poly-pharmacy”

PRIORITY Objective H2020-PHC-25-2015 - Advanced ICT systems and services for integrated care

Security and Privacy Suite (SPS) Component Test Plan and Design

Work Package: WP9 Evaluation and Assessment

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Dissemination Level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	
EU-RES	Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)	
EU-CON	Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)	
EU-SEC	Classified Information: SECRET UE (Commission Decision 2005/444/EC)	

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2. INTRODUCTION

2.1. Background

This current test plan is for the component testing of the C3-Cloud Security and Privacy Suite (SPS) component.

2.2. Objectives of the Test Plan

The test plan objectives are:

- define the scope of what will be tested;
- specify the approach taken to testing;
- specify how the testing results will be evaluated.

2.3. Objectives of the Component Test

Check and verify that the implemented component functionalities meet the specified requirements. The technical requirements were first created in tasks T3.2 and T3.3 and have been updated a few times as part of task T3.4.

2.4. References

Standards and deliverables:

- IEEE Std 829-1998, Standard for Software Test Documentation Deliverables
- D3.2 “Requirements Specification of the C3-Cloud Architecture”
- D3.3 “Conceptual Design of the C3-Cloud Architecture”
- D8.1 “Use Cases and Requirement Specifications of the Pilot Application”
- D9.1 “Functional and Non-Functional Testing Criteria for C3-Cloud Components”

Within the scope of Task 3.4, the Pilot Application Requirements (PARs) of D8.1 and the Requirements Traceability Matrix (RTM) of D3.2 and D3.3 have been reviewed and updated by May 2018.

3. TEST ITEMS

ID	Name	Type
SPS-MANAGER	SPS Web Application	Software
SPS-SERVER	SPS Server side	Software
SPS-AUDIT-REPO	SPS Audit Record Repository	Software

Table 1: Items to be tested

4. FEATURES TO BE TESTED

The following test cases have been identified based on use cases.

ID	Description	Covered use case(s)
T-SPS-1	Create care team member account	SPS-1: Create Care Team Member Account
T-SPS-2	Authenticate care team member via existing business	SPS-2: Authenticate User

	account	
T-SPS-3	Authenticate care team member via C3-Cloud account	SPS-2: Authenticate User
T-SPS-4	Authorise care team member	SPS-3: Authorise User
T-SPS-5	Manage access control policies	SPS-4: Manage Access Control Policies
T-SPS-6	Store and view audit trail record	SPS-5: Log Audit

5. FEATURES NOT TO BE TESTED

None.

6. APPROACH

This section outlines the global approach of the component testing.

6.1. Criticality of features to be tested

ID	Description	Criticality level
T-SPS-1	Create care team member account	Level 3
T-SPS-2	Authenticate care team member via existing business account	Level 3
T-SPS-3	Authenticate care team member via C3-Cloud account	Level 4
T-SPS-4	Authorise care team member	Level 3
T-SPS-5	Manage access control policies	Level 2
T-SPS-6	Store and view audit trail record	Level 1

Common levels of criticality are:

- *Level 0: No criticality evaluated, suppletive or non-effective functions;*
- *Level 1: Low criticality, tolerability of certain inadequate system functions and tools;*
- *Level 2: Heightened criticality, scheduled downtime is acceptable;*
- *Level 3: High criticality, failure will cause degraded mode to numerous systems;*
- *Level 4: Highest criticality, system functions, failure will cause unrecoverable and critical errors to numerous systems.*

6.2. Test level and technique

ID	Test level	Techniques involved in tests
T-SPS-1	Component	Conformance testing, expert reviewing.
T-SPS-2	Integration	Data-driven testing, expert review.
T-SPS-3	Component	Conformance testing, expert reviewing.
T-SPS-4	Integration	Data-driven testing, expert review.
T-SPS-5	Component	Conformance testing, expert reviewing.

T-SPS-6	Component	Conformance testing, expert reviewing.
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6.3. Priority of execution of tests

T-SPS-1 shall be done before T-SPS-3. Either T-SPS-2 or T-SPS-3 shall take place before T-SPS-4, which eventually shall take place before T-SPS-6. T-SPS-5 does not have any significant priority so can be done at any time.

6.4. Monitoring test advancement and metrics

Metrics used in all data-driven and expert reviewing tests (T-SPS-2, T-SPS-4) are precision, recall and f-measure. Metrics used in Conformance tests (T-SPS-1, T-SPS-3, T-SPS-5, T-SPS-6) are rates of failure.

6.5. Management of defects

SRDC development team is notified of all defects found in testing. If defect is caused by an external Identity Provider (IdP) system of a pilot site, then respective development teams (e.g. RJH) will also be notified. The test continues with the next item.

6.6. Test tools used

Postman. Custom Node.js scripts. Gitlab Issue Tracker. Asana.

7. ITEM PASS/FAIL CRITERIA

ID	Criteria
SPS-MANAGER	The reference content for testing is displayed as expected and stored in the SPS-MANAGER.
SPS-SERVER	No errors logged during authentication & authorization requests and storage. The resulting data at either end is the expected when the reference content for testing is used.
SPS-AUDIT-REPO	No errors logged during integration and storage. The resulting data at either end is the expected when the reference content for testing is used.

7.1. Evaluation Team

Evaluation Team of the SPS Component tests will be composed by at least one representative from:

- SRDC as development team,
- RJH as development team of linked Identity Provider

Members of the test team (see 10.1) can be members of the evaluation team. Additional people from their respective partners might be involved in the evaluation team.

7.2. Evaluation Process

Evaluating the results of the testing in order to make a decision about whether the test item has passed or failed. The stages are:

1. **Summarise Testing Results** – This deals with taking all incidents and tracing them back to the requirements they affected.

2. **Make Acceptance Decision** – A decision is then taken as to whether to accept or reject the item.

7.3. Requirements Traceability Matrix

The matching of SPS test cases with the functional requirements in the C3-Cloud Requirements Traceability Matrix (RTM) is provided below. The complete RTM is provided along with the main deliverable D9.3.

ID	Description	Corresponding requirements in the matrix
T-SPS-1	Create care team member account	SPS-FR-3
T-SPS-2	Authenticate care team member via existing business account	SPS-FR-1, SPS-FR-5, SPS-FR-6, SPS-FR-7, SPS-FR-8
T-SPS-3	Authenticate care team member via C3-Cloud account	SPS-FR-2, SPS-FR-5, SPS-FR-6, SPS-FR-7, SPS-FR-8
T-SPS-4	Authorise care team member	SPS-FR-13, SPS-FR-15
T-SPS-5	Manage access control policies	SPS-FR-9, SPS-FR-10, SPS-FR-11, SPS-FR-12
T-SPS-6	Store and view audit trail record	SPS-FR-16, SPS-FR-17

8. TEST PLAN PASS/FAIL CRITERIA

No critical or medium level incidents shall occur in any of the SPS items.

9. SUSPENSION CRITERIA AND RESUMPTION REQUIREMENTS

SPS component testing should be interrupted if:

- Communication of the SPS-MANAGER with SPS-SERVER fails.
- Login failure via SPS-MANAGER or linked IdPs.
- Communication with the SPS-AUDIT-REPO fails in relevant audit tests.
- Any other critical failure that prevents planned tests to proceed.

Testing can resume when critical incidents have been resolved.

10. TEST DELIVERABLES

The testing will use and produce the following output:

5. **Test Plan and Design** – The overall plan and design for testing.
6. **Test Results** – The results of running the tests (summary reports, logs, incident reports).

11. TESTING TASKS

11.1. Roles and Responsibilities

Role	Name	Entity
Test Manager	Mustafa Yuksel	SRDC

Development Tester	Bunyamin Sarigul	SRDC
Expert	Gokce B. Laleci Erturkmen	SRDC
RJH Expert	Matias Wurschmidt-Wang	RJH
RJH / Tieto Expert	Lars Forsgren	RJH / Tieto

11.2. Test preparation

This subsection identifies all tasks required for test preparation.

Task description	Person Responsible
Setting up testing environment	SRDC, Pilot sites
Creating reference content for testing	SRDC, Pilot sites
Adding testing reference content to testing environment	SRDC
Creating user accounts for testing	SRDC, Pilot sites

11.3. Test execution

The testers follow the provided manuals during testing.

ID	Description	Steps
T-SPS-1	Create care team member account	<ol style="list-style-type: none"> Login to SPS manager with admin account Click “Invite user” OR “Register user” Enter new user information New user is informed
T-SPS-2	Authenticate care team member via existing business account	<ol style="list-style-type: none"> Open C3DP login page Select Identity Provider (IdP) from the list When forwarded to the corresponding login page of the IdP, enter username and password User is redirected to C3DP upon successful login
T-SPS-3	Authenticate care team member via C3-Cloud account	<ol style="list-style-type: none"> Open C3DP login page Select C3-Cloud Identity Provider (IdP) from the list When forwarded to the corresponding login page of the C3-Cloud IdP, enter username and password User is redirected to C3DP upon successful login
T-SPS-4	Authorise care team member	<ol style="list-style-type: none"> User tries to perform a CRUD operation on a care plan in C3DP If the user has sufficient privileges (e.g. a doctor trying to update a care plan), she is allowed to do so If the user does not have sufficient privileges (e.g. a nurse assistant trying to update a care plan), then she is informed accordingly
T-SPS-5	Manage access control	<ol style="list-style-type: none"> Login to SPS manager with admin account

	policies	b. Click “Access policy” c. View the access control permissions per FHIR resource and per user role d. Update any permission e. Save
T-SPS-6	Store and view audit trail record	a. Perform any CRUD operation on any patient data (either via C3DP, PEP or TIS) b. C3-Cloud FHIR Repository automatically creates the corresponding audit trail record c. Login to SPS manager with admin account d. Click on “Access logs” e. View audit trail records and filter according to needs

12. ENVIRONMENTAL NEEDS

Testing environment requirements:

- Deployed environment with C3DP, SPS application components, external Identity Providers and the C3-Cloud FHIR repository.

10.2 Appendix 2 Component Test Results

This section consists of 6 sets of test results for the following components:

- 10.2.1. C3DP
- 10.2.2. PEP
- 10.2.3. CDSM
- 10.2.4. TIS
- 10.2.5. SIS
- 10.2.6. SPS
- 10.2.7. C3DP

10.2.1 C3DP Test Results



C3-Cloud

“A Federated Collaborative Care Cure Cloud Architecture for Addressing the Needs of Multi-morbidity and Managing Poly-pharmacy”

PRIORITY Objective H2020-PHC-25-2015 - Advanced ICT systems and services for integrated care

Coordinated Care and Cure Delivery Platform (C3DP) Component Test Results

Work Package: WP9 Evaluation and Assessment
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v0.1	01-06-2018	Initial structure	SRDC	SRDC
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1. INTRODUCTION

1.1. Background

This current test results document is for reporting the component testing results of the C3-Cloud Coordinated Care and Cure Delivery Platform (C3DP) component.

1.2. Objectives of the Test Results

The test result objectives are:

- present the tests run on the component;
- report the results of component testing;
- report any event that occurred during the testing process that requires investigation;
- explain the impact of the detected anomalies on the component;
- explain how the detected anomalies are managed as incident reports and how they are taken into account in the component update cycle.

This document merges the following test document templates of the IEEE Std 829-1998 - Standard for Software Test Documentation Deliverables:

- Component Test Procedure
- Component Test Log
- Component Test Incident Report
- Component Test Summary Report

1.3. Objectives of the Component Test

Check and verify that the implemented component functionalities meet the specified requirements. The technical requirements were first created in tasks T3.2 and T3.3 and have been updated a few times as part of task T3.4.

1.4. References

Standards and deliverables:

- IEEE Std 829-1998, Standard for Software Test Documentation Deliverables
- D3.2 “Requirements Specification of the C3-Cloud Architecture”
- D3.3 “Conceptual Design of the C3-Cloud Architecture”
- D8.1 “Use Cases and Requirement Specifications of the Pilot Application”
- D9.1 “Functional and Non-Functional Testing Criteria for C3-Cloud Components”

Within the scope of Task 3.4, the Pilot Application Requirements (PARs) of D8.1 and the Requirements Traceability Matrix (RTM) of D3.2 and D3.3 have been reviewed and updated by May 2018.

2. TEST DATA

The test data that is used in component testing is composed mainly of the following:

- reference care plan example and associated patient medical summary that is prepared and modelled in FHIR resources by technical partner SRDC,
- realistic care plan examples and associated patient medical summary provided by pilot sites and modelled in FHIR resources by SRDC,
- patient questionnaires identified by pilot sites and modelled in FHIR resources by MEDIXINE,

- patient education materials identified by pilot sites and modelled in FHIR resources by SRDC,
- health professional user accounts created in C3-Cloud default Identity Provider,
- patient user accounts created in PEP.

3. TEST EXECUTION

The following test cases have been executed with the involvement of the test team presented in the Test Plan and Design document. There has not been any change in the environmental testing setup described in the same plan document:

- T-C3DP-1: Create care plan
- T-C3DP-2: Review care plan dashboard
- T-C3DP-3: Manage care team
- T-C3DP-4: Review patient provided observations
- T-C3DP-5: Update care plan
- T-C3DP-6: Safe messaging with professionals
- T-C3DP-7: Safe messaging with patient

In addition to the concise test step execution descriptions below, the testers are also provided with detailed user manuals that explain each functionality of C3DP and relevant applications like PEP, as a part of the root deliverable D9.3 “Test and Evaluation Report for C3-Cloud Components”.

The results of execution of each test case is provided in a dedicated sub-section below.

3.1. T-C3DP-1 Create care plan

4. EXECUTION DESCRIPTION

The testers followed the following test steps in this test case:

1. View patient list
2. Search and select a patient
3. Review medical summary
4. Create a care plan
5. Create a care team (optional)
6. Add new goals (either manually or by accepting and adapting the personalized recommendations from the clinical decision support services)
7. Add new activity (either manually or by accepting and adapting the personalized recommendations from the clinical decision support services)
8. Add new education material
9. Save and share care plan with Care Team Members
10. Export Care Plan as a PDF document

4.1.1 Procedure result

This is the most comprehensive and overarching test case that includes a majority of the functionalities of the C3DP and the other integrated C3-Cloud components like CDS services. The test has been completed with SUCCESS. Some anomalies were observed as presented in detail in the next section. The impact of these were either medium or low. They have either been already fixed and retested; or assigned for resolution by following the original software development cycle. Apart from these, no interrupting anomaly occurred.

4.1.2 Incidents and other anomalous events

ID	Description	Impact	Status
I-C3DP-11	There is a unit related error when a specific target value is put in a goal.target through the new goal adding screen, e.g. for “Keep HbA1c under control” predefined goal with a target value of 6.5%	Medium	Retested with fix confirmed
I-C3DP-12	It is not possible to assign a quantity for a general activity in a structured manner, such as “500 meters” for a walking activity	Low	Retested with fix confirmed
I-C3DP-13	The set by attribute is empty when a goal is added manually by selecting among predefined goals	Low	Retested with fix confirmed
I-C3DP-14	It is rather time consuming to include all conditions of a patient into his care plan by selecting each; the UI would rather preselect all conditions for inclusion and allow users to remove any unwanted	Low	Retested with fix confirmed
I-C3DP-15	Updates done on the previously set clinical concepts in the required patient data blocks of high-level goals are not stored persistently, i.e. it is not possible to set a clinical concept’s value to “no” or “unknown” if it is a “yes”. This works without a problem in the chronic disease profile page though.	Medium	Assigned for resolution
I-C3DP-16	The date of a referral suggested by a CDS service was too old. The problem is due to fixed dates in the static CDS service recommendations in the care plan templates.	Medium	Assigned for resolution
I-C3DP-17	It is not possible to enter a specific target value for blood pressure in a structured manner because only one target value can be set while the BP has systolic and diastolic components	Low	Approved for resolution
I-C3DP-18	PDF export functionality works in some care plans but not in all	Medium	Approved for resolution

4.2. T-C3DP-2 Review care plan dashboard

4.2.1 Execution description

The testers followed the following test steps in this test case:

1. View patient list
2. Review medical summary of a selected patient
3. Review your activities in your calendar

4.2.2 Procedure result

The test has been completed with SUCCESS. No anomaly was observed during testing.

4.2.3 Incidents and other anomalous events

No incidents or other anomalous events were detected.

4.3. T-C3DP-3 Manage care team

4.3.1 Execution description

The testers followed the following test steps in this test case:

1. View patient list
2. Search and select a patient
3. Open the care plan of a specific patient
4. View the care team associated with this care plan
5. Invite a Care Team Member
6. Logout and log-in as the invited care team member
7. View the care team membership invitation from your messages and accept it
8. Logout and log-in as the care team manager
9. View the care team of the care plan of the selected patient, where the newly invited member is added to the care team
10. Remove a care team member

4.3.2 Procedure result

The test has been completed with SUCCESS. Some anomalies were observed as presented in detail in the next section. The impact of these were either medium or low. They have either been already fixed and retested; or assigned for resolution by following the original software development cycle. Apart from these, no interrupting anomaly occurred.

4.3.3 Incidents and other anomalous events

ID	Description	Impact	Status
I-C3DP-31	In the care team invitation screen, search does not return all the available health professionals available in the repository. There is a problem in processing of REST API paging results	Medium	Retested with fix confirmed
I-C3DP-32	An error occurs while trying to assign a care team member to an organization. The error is related with the official FHIR validator that is used in the FHIR Repository.	Medium	Retested with fix confirmed
I-C3DP-33	The automatic care team invitation message should be categorized under “System notifications”	Low	Assigned for resolution
I-C3DP-34	In the care team invitation screen, it is not possible to search and filter health professionals according to role, only by name	Low	Assigned for resolution

4.4. T-C3DP-4 Review patient provided observations

4.4.1 Execution description

The testers followed the following test steps in this test case:

Alternative A

1. View patient list
2. Search and select a patient
3. Review medical summary of a selected patient

4. Observe patient provided observations such as blood pressure measurements

Alternative B

1. View patient list
2. Search and select a patient
3. Review care plan of a selected patient
4. Observe patient provided observations in the related activities such as blood pressure measurements, assigned questionnaires, daily meal photo observations
5. Observe patient provided observations in a single dashboard by opening the Patient Data View

Alternative C

1. Check your notifications
2. Upon seeing a notification such as “Observation Created” or “Patient filled a questionnaire”, click on it.
3. Review patient provided data

4.4.2 Procedure result

The test has been completed with SUCCESS. Some anomalies were observed as presented in detail in the next section. The impact of these were either high, medium or low. Those with high or medium impact have been already fixed and retested; and the other with low impact has been assigned for resolution by following the original software development cycle. Apart from these, no interrupting anomaly occurred.

4.4.3 Incidents and other anomalous events

ID	Description	Impact	Status
I-C3DP-41	There is a problem with the questionnaire response viewer module of C3DP. It fails in displaying some questionnaires.	High	Retested with fix confirmed
I-C3DP-42	A weight measurement provided via PEP is not matching with the already existing weight measurements in the C3DP. The reason is using different LOINC codes in each side.	Medium	Retested with fix confirmed
I-C3DP-43	The links in the notification messages for “Observation Created” and “Patient filled a questionnaire” are not ideal, one is going to the list of care plans and the other to the medical summary view. Both should direct to patient provided data view.	Low	Assigned for resolution

4.5. T-C3DP-5 Update care plan

4.5.1 Execution description

The testers followed the following test steps in this test case:

1. View patient list
2. Search and select a patient
3. Review care plan of a selected patient

4. Review and update the existing goals (e.g. update their status)
5. Add notes to the existing goals (to tag them to be reviewed by care team members)
6. Review and update the existing activities (e.g. update their status)
7. Add progress notes to the existing goals (to tag them to be reviewed by care team members)

4.5.2 Procedure result

This is another comprehensive test case. The test has been completed with SUCCESS. Some anomalies were observed as presented in detail in the next section. The impact of these were either high or low, and they have already been fixed and retested. Apart from these, no interrupting anomaly occurred.

4.5.3 Incidents and other anomalous events

ID	Description	Impact	Status
I-C3DP-51	It is not possible to update the category of a goal persistently. The UI says it is updated but after closing and opening the details again, the category is lost	Low	Retested with fix confirmed
I-C3DP-52	Once set, it is not possible to edit time and status attributes of a Referral Request. The referred by attribute is not set either.	High	Retested with fix confirmed

4.6. T-C3DP-6 Safe messaging with professionals

4.6.1 Execution description

The testers followed the following test steps in this test case:

Alternative A

1. Open Messages Module
2. Click Care Team Members tab
3. Open a message received from a care team member
4. Reply to this message

Alternative B

1. Open Messages Module
2. Click 'New Message'
3. Write the name of a care team member, and select him/her as the recipient
4. Write a new message and send it.

4.6.2 Procedure result

The test has been completed with SUCCESS. No anomaly was observed during testing.

4.6.3 Incidents and other anomalous events

No incidents or other anomalous events were detected.

4.7. T-C3DP-7 Safe messaging with patient

4.7.1 Execution description

The testers followed the following test steps in this test case:

Alternative A

1. Open Messages Module
2. Click Patients tab
3. Open a received message received from a patient
4. Reply to this message

Alternative B

1. Open Messages Module
2. Click 'New Message'
3. Write the name of one of your patients, and select him/her as the recipient
4. Write a new message and send it.

4.7.2 Procedure result

The test has been completed with SUCCESS. Only one anomaly was observed as presented in detail in the next section. The impact of it was high, and it has already been fixed and retested. Apart from these, no interrupting anomaly occurred.

4.7.3 Incidents and other anomalous events

ID	Description	Impact	Status
I-C3DP-71	It is not possible to view a message sent by the patient via PEP in C3DP. The issue is related with setting the recipient status code on the PEP side.	High	Retested with fix confirmed

5. CONCLUSION

All test cases have been completed with SUCCESS. Some anomalies with mostly low or medium and very rarely high impact were detected, but most of them were already fixed during the active component testing session, so that they were retested successfully.

The anomalies detected during component testing have first been noted down, when known with the original cause of the anomaly. Then corresponding incident records have been created. SRDC prefers GitLab Issue Tracker that is automatically integrated with the software source code base for issue management, and Asana for higher-level task management among the team members. A snapshot of the C3DP issue log from the GitLab Issue Tracker is provided in the figure below.

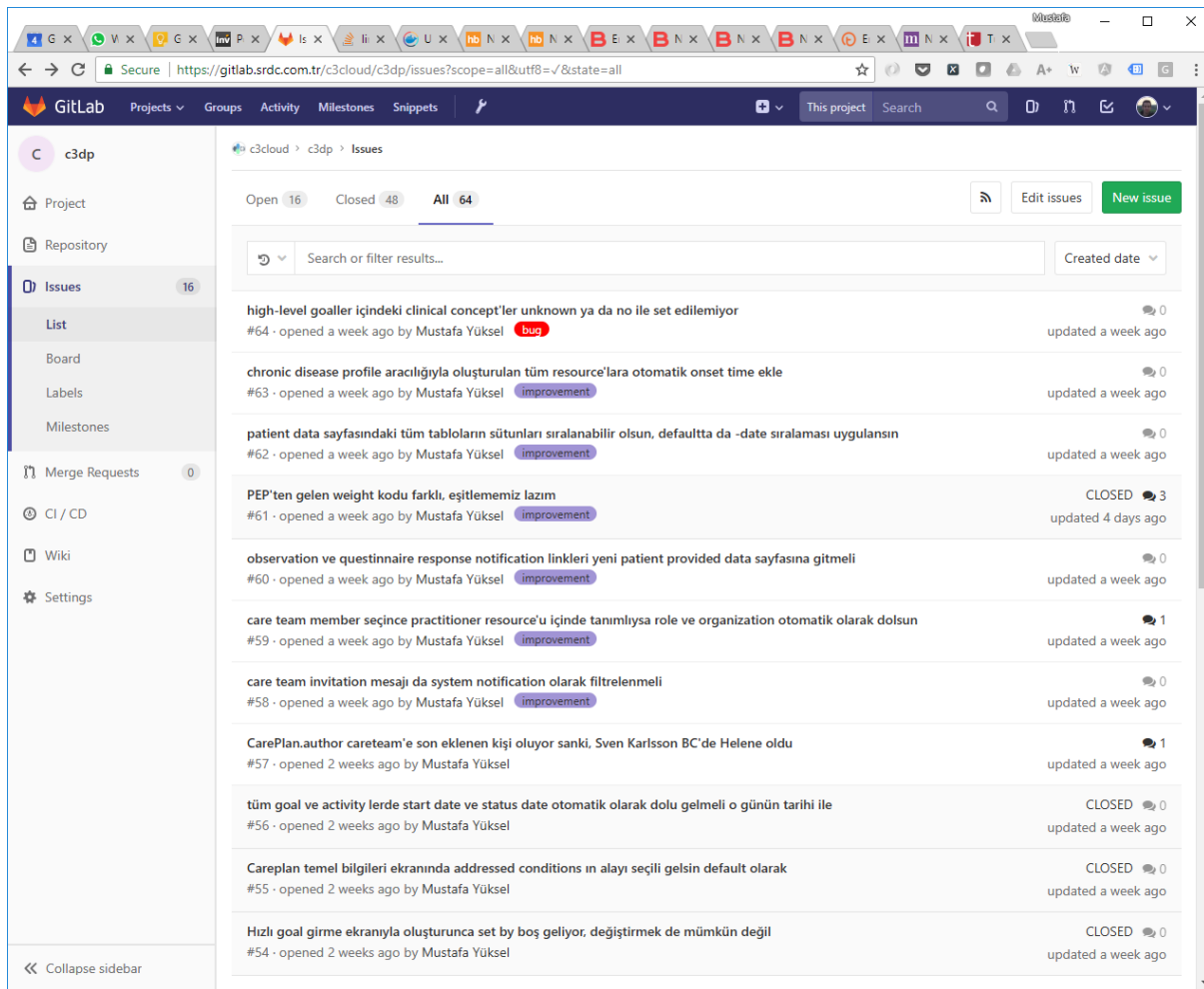


Figure A2.1- 1 A screenshot from the C3DP issues log [GitLab Issue Tracker]

Following identification, detailed analysis of the issues by the development team has taken place. Majority of the reported incidents have already been fixed and retested during the component testing phase as already reported in the incident tables of the previous section. The remaining incidents have already been assigned for resolution and will be fixed in the upcoming weeks. They will continue to be tracked via the incidents available in SRDC GitLab Issue Tracker.

10.2.2 PEP Test Results



C3-Cloud

“A Federated Collaborative Care Cure Cloud Architecture for Addressing the Needs of Multi-morbidity and Managing Poly-pharmacy”

PRIORITY Objective H2020-PHC-25-2015 - Advanced ICT systems and services for integrated care

Patient Empowerment Platform (PEP) Component Test Results

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Document Leader: MEDIXINE

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EU-SEC	Classified Information: SECRET UE (Commission Decision 2005/444/EC)	

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1 Introduction

1.1 Background

This current test results document is for reporting the component testing results of the C3-Cloud Patient Empowerment Platform (PEP) component.

1.2 Objectives of the Test Results

The test result objectives are:

- present the tests run on the component;
- report the results of component testing;
- report any event that occurred during the testing process that requires investigation;
- explain the impact of the detected anomalies on the component;
- explain how the detected anomalies are managed as incident reports and how they are taken into account in the component update cycle.

This document merges the following test document templates of the IEEE Std 829-1998 - Standard for Software Test Documentation Deliverables:

- Component Test Procedure
- Component Test Log
- Component Test Incident Report
- Component Test Summary Report

1.3 Objectives of the Component Test

Check and verify that the implemented component functionalities meet the specified requirements. The technical requirements were first created in tasks T3.2 and T3.3 and have been updated a few times as part of task T3.4.

1.4 References

Standards and deliverables:

- IEEE Std 829-1998, Standard for Software Test Documentation Deliverables
- D3.2 “Requirements Specification of the C3-Cloud Architecture”
- D3.3 “Conceptual Design of the C3-Cloud Architecture”
- D8.1 “Use Cases and Requirement Specifications of the Pilot Application”
- D9.1 “Functional and Non-Functional Testing Criteria for C3-Cloud Components”

Within the scope of Task 3.4, the Pilot Application Requirements (PARs) of D8.1 and the Requirements Traceability Matrix (RTM) of D3.2 and D3.3 have been reviewed and updated by May 2018.

2 Test Data

The test data that is used in component testing is composed mainly of the following:

- reference care plan example and associated patient medical summary that is prepared and modelled in FHIR resources by technical partner SRDC,
- realistic care plan examples and associated patient medical summary provided by pilot sites and modelled in FHIR resources by SRDC,
- patient questionnaires identified by pilot sites and modelled in FHIR resources by MEDIXINE,
- patient education materials identified by pilot sites and modelled in FHIR resources by SRDC,
- patient user accounts created in PEP.

3 Test Execution

The following test cases have been executed with the involvement of the test team presented in the Test Plan and Design document.

There has not been any change in the environmental testing setup described in the same plan document.

ID	Name
T-PEP-1	Synchronize MDT
T-PEP-2	Synchronize patient
T-PEP-3	Synchronize careplan
T-PEP-4	View careplan
T-PEP-5	Complete questionnaires
T-PEP-6	Synchronize observations
T-PEP-7	Communicate with MDT

In addition to the concise test step execution descriptions below, the testers are also provided with detailed user manuals that explain each functionality of PEP and relevant applications like C3DP, as a part of the root deliverable D9.3 “Test and Evaluation Report for C3-Cloud Components”.

4 Test Results

4.1 Test overall result

The overall test result was SUCCESS.

4.2 Incidents

Testing have been logged into the issue tracking solution used by Medixine (Microsoft VSTS).

SRDC has been notified issues related to integration and are investigated together.

Description	Impact	Status
Timestamp handling in integration needs to be checked. Some inconsistent time zone handling were encountered (a few hour difference in timestamp across components).	Low	Open
Some PEP structure attributes were not set properly when data read from FHIR and caused some minor issues.	Low	Fixed
Some of the content from C3DP contained some special characters not allowed by default for security reasons.	Low	Fixed
The LOINC for blood pressure was decided to be changed from old recommended to the newer one.	Low	Fixed
Testing environment configuration included features not in scope. The system configuration to be checked for all deployments.	Low	Open
Navigation from settings page to care plan loses page	Low	Open

layout.		
Care plan meta data (created by, next review etc.) not updated in PEP integration when care plan updated in C3DP.	Low	Open

10.2.3 CDSM Test Results



C3-Cloud

“A Federated Collaborative Care Cure Cloud Architecture for Addressing the Needs of Multi-morbidity and Managing Poly-pharmacy”

PRIORITY Objective H2020-PHC-25-2015 - Advanced ICT systems and services for integrated care

Clinical Decision Support Module (CDSM) Component Test Results

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1 INTRODUCTION

1.1 Background

This current test results document is for reporting the component testing results of the C3-Cloud Clinical Decision Support Module (CDSM) component.

1.2 Objectives of the Test Results

The test result objectives are:

- present the tests run on the component;
- report the results of component testing;
- report any event that occurred during the testing process that requires investigation;
- explain the impact of the detected anomalies on the component;
- explain how the detected anomalies are managed as incident reports and how they are taken into account in the component update cycle.

This document merges the following test document templates of the IEEE Std 829-1998 - Standard for Software Test Documentation Deliverables:

- Component Test Procedure
- Component Test Log
- Component Test Incident Report
- Component Test Summary Report

1.3 Objectives of the Component Test

Check and verify that the implemented component functionalities meet the specified requirements. The technical requirements were first created in tasks T3.2 and T3.3 and have been updated in T7.2 and maintained as part of task T3.4.

1.4 References

Standards and deliverables:

- IEEE Std 829-1998, Standard for Software Test Documentation Deliverables
- D3.2 “Requirements Specification of the C3-Cloud Architecture”
- D3.3 “Conceptual Design of the C3-Cloud Architecture”
- D7.2 “Clinical Decision Support Modules for Personalised Care Plan Development and Execution”
- D8.1 “Use Cases and Requirement Specifications of the Pilot Application”
- D9.1 “Functional and Non-Functional Testing Criteria for C3-Cloud Components”

Within the scope of Task 3.4, the Pilot Application Requirements (PARs) of D8.1 and the Requirements Traceability Matrix (RTM) of D3.2 and D3.3 have been reviewed and updated by May 2018.

2 TEST DATA

The test data that is used in component testing is composed mainly of the following:

- Test patient data provided by SRDC and CAMBIO
- Test drug interaction data provided by WARWICK

3 TEST EXECUTION

The following test cases have been executed with the involvement of the test team presented in the Test Plan and Design document. There has not been any change in the environmental testing setup described in the same plan document:

- T-CDSM-1: CDS-Hooks API test
- T-CDSM-2: DM2, RF, HF and Depression guideline rules test
- T-CDSM-3: Reconciliation test
- T-CDSM-4: Drug-drug interaction test
- T-CDSM-5: Drug-disease interaction test

The results of execution of each test case is provided in a dedicated sub-section below.

3.1 T-CDSM-1 CDS-Hooks API test

3.1.1 Execution description

The testers followed the following test steps in this test case:

11. Deploy a guideline to GDL2 CDS engine
12. C3DP sends an HTTP POST request with prefetched FHIR resources to GDL2 CDS engine
13. GDL2 engine accepts the request
14. GDL2 engine executes the requested guideline and produces an array of CDS-Hooks cards
15. GDL2 engine returns 200 OK with the card array
16. C3DP accepts the response and displays the cards
17. Verify the displayed cards

3.1.2 Procedure result

The test has been completed with SUCCESS. No anomaly was observed during testing.

3.1.3 Incidents and other anomalous events

No incidents or other anomalous events were detected.

3.2 T-CDSM-2: DM2, RF, HF and Depression guideline rules test

3.2.1 Execution description

The testers followed the following test steps in this test case:

4. Open GDL2 editor
5. Load FHIR profiles into the editor
6. Load a guideline file into the editor
7. On the execution tab, choose value for each input field
8. Run “Execute Cards”
9. Verify the results of execution against the technical specification
10. Repeat steps 4-6 for alternative input value combinations

3.2.2 Procedure result

The test has been completed with SUCCESS. No anomaly was observed during testing.

3.2.3 Incidents and other anomalous events

No incidents or other anomalous events were detected.

3.3 T-CDSM-3: Reconciliation test

3.3.1 Execution description

The testers followed the following test steps in this test case:

11. Open GDL2 editor
12. Load FHIR profiles into the editor
13. Load a reconciled guideline file into the editor
14. On the execution tab, choose value for each input field
15. Run “Execute Cards”
16. Verify the results of execution against the technical specification
17. Repeat steps 4-6 for alternative input value combinations

3.3.2 Procedure result

The test has been completed with SUCCESS. No anomaly was observed during testing.

3.3.3 Incidents and other anomalous events

No incidents or other anomalous events were detected.

3.4 T-CDSM-4: Drug-drug interaction test

3.4.1 Execution description

The testers followed the following test steps in this test case:

Alternative A

1. C3DP sends an HTTP GET request with a pair of drug codes known to have interactions in the interaction test dataset to the drug-drug interaction endpoint of the drug interaction service
2. The drug interaction service accepts the request and executes the query
3. The drug interaction service returns 200 OK with the found drug-drug interaction data
4. Verify the returned result is MATCH with expected information

Alternative B

1. C3DP sends an HTTP GET request with a drug code known to have drug interactions in the interaction test dataset to the drug-drug interaction endpoint of the drug interaction service
2. The drug interaction service accepts the request and executes the query
3. The drug interaction service returns 200 OK with all drug-drug interaction data associated with the requested drug code
4. Verify the returned result is MATCH with expected information

Alternative C

1. C3DP sends an HTTP GET request with a pair of drug codes known to have NO interactions in the interaction test dataset to the drug-drug interaction endpoint of the drug interaction service
2. The drug interaction service accepts the request and executes the query
3. The drug interaction service returns 200 OK with a NO-INTERACTION message
4. Verify the returned result is NO-INTERACTION

Alternative D

1. C3DP sends an HTTP GET request with a drug code known to NOT exist in the drug-drug interaction test dataset to the drug-drug interaction endpoint of the drug interaction service
2. The drug interaction service accepts the request and executes the query
3. The drug interaction service returns 200 OK with a NO-SUBSTANCE message
4. Verify the returned result is NO-SUBSTANCE

3.4.2 Procedure result

The test has been completed with SUCCESS. No anomaly was observed during testing.

3.4.3 Incidents and other anomalous events

No incidents or other anomalous events were detected.

3.5 T-CDSM-5: Drug-disease interaction test

3.5.1 Execution description

The testers followed the following test steps in this test case:

Alternative A

1. C3DP sends an HTTP GET request with a pair of drug code and disease code known to have interactions in the interaction test dataset to the drug-disease interaction endpoint of the drug interaction service
2. The drug interaction service accepts the request and executes the query
3. The drug interaction service returns 200 OK with the found drug-disease interaction data
4. Verify the returned result is MATCH with expected information

Alternative B

1. C3DP sends an HTTP GET request with a drug code known to have disease interactions in the interaction test dataset to the drug-disease interaction endpoint of the drug interaction service
2. The drug interaction service accepts the request and executes the query
3. The drug interaction service returns 200 OK with all drug-disease interaction data associated with the requested drug code
4. Verify the returned result is MATCH with expected information

Alternative C

1. C3DP sends an HTTP GET request with a pair of drug code and disease code known to have NO interactions in the interaction test dataset to the drug-disease interaction endpoint of the drug interaction service
2. The drug interaction service accepts the request and executes the query
3. The drug interaction service returns 200 OK with a NO-INTERACTION message
4. Verify the returned result is NO-INTERACTION

Alternative D

1. C3DP sends an HTTP GET request with a drug code known to NOT exist in the drug-disease interaction test dataset to the drug-disease interaction endpoint of the drug interaction service
2. The drug interaction service accepts the request and executes the query
3. The drug interaction service returns 200 OK with a NO-SUBSTANCE message
4. Verify the returned result is NO-SUBSTANCE

3.5.2 Procedure result

The test has been completed with SUCCESS. No anomaly was observed during testing.

3.5.3 Incidents and other anomalous events

No incidents or other anomalous events were detected.

4 CONCLUSION

All test cases have been completed with SUCCESS. Some minor issues were identified during first iterations of the testing. They were mainly due to the data format issues between C3DP and CDSM services. The issues were fixed quickly, so that they were retested successfully during later iterations of the testing. Any issues being detected during the component testing were documented and analysed. Related parties were notified with fix suggestions when the root cause was identified. While most of the bugs were minor and were resolved quickly through email or video conferencing, more sever technical issues or longer term feature requests are managed using the GitLab Issue Tracker system. GitLab is the main tool of the project for source version control.

10.2.4 TIS Test Results



C3-Cloud

“A Federated Collaborative Care Cure Cloud Architecture for Addressing the Needs of Multi-morbidity and Managing Poly-pharmacy”

PRIORITY Objective H2020-PHC-25-2015 - Advanced ICT systems and services for integrated care

Technical Interoperability Suite (TIS) Component Test Results

Work Package: WP9 Evaluation and Assessment
Due Date: 30 June 2018
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Dissemination Level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	
EU-RES	Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)	
EU-CON	Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)	
EU-SEC	Classified Information: SECRET UE (Commission Decision 2005/444/EC)	

Document History:

Version	Date	Changes	From	Review
v0.1	08-06-2018	First draft of test result report	WARWICK	Task 9.2
V0.2	15-06-2018	Complete version	WARWICK	Task 9.2

Contributors (Benef.)	Lei Zhao (WARWICK)			
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1 INTRODUCTION

1.1 Background

This current test results document is for reporting the component testing results of the C3-Cloud Technical Interoperability Suite (TIS) component.

1.2 Objectives of the Test Results

The test result objectives are:

- present the tests run on the component;
- report the results of component testing;
- report any event that occurred during the testing process that requires investigation;
- explain the impact of the detected anomalies on the component;
- explain how the detected anomalies are managed as incident reports and how they are taken into account in the component update cycle.

This document merges the following test document templates of the IEEE Std 829-1998 - Standard for Software Test Documentation Deliverables:

- Component Test Procedure
- Component Test Log
- Component Test Incident Report
- Component Test Summary Report

1.3 Objectives of the Component Test

Check and verify that the implemented component functionalities meet the specified requirements. The technical requirements were first created in tasks T3.2 and T3.3 and have been updated in T6.1 and maintained as part of task T3.4.

1.4 References

Standards and deliverables:

- IEEE Std 829-1998, Standard for Software Test Documentation Deliverables
- D3.2 “Requirements Specification of the C3-Cloud Architecture”
- D3.3 “Conceptual Design of the C3-Cloud Architecture”
- D6.1 “Technical Interoperability Implementation Guidelines and Open Source Toolkits”
- D8.1 “Use Cases and Requirement Specifications of the Pilot Application”
- D9.1 “Functional and Non-Functional Testing Criteria for C3-Cloud Components”

Within the scope of Task 3.4, the Pilot Application Requirements (PARs) of D8.1 and the Requirements Traceability Matrix (RTM) of D3.2 and D3.3 have been reviewed and updated by May 2018.

2 TEST DATA

The test data that is used in component testing is composed mainly of the following:

- Test patient identifiers provided by OSAKI, RJH and SWFT
- Test data import task provided by WARWICK
- Test CDA service provided by OSAKI
- Test Open Services provided by RJH
- Test EMIS and Lorenzo/GAP data extract CSV files provided by SWFT

3 TEST EXECUTION

The following test cases have been executed with the involvement of the test team presented in the Test Plan and Design document. There has not been any change in the environmental testing setup described in the same plan document:

- T-TIS-1: Register Patient
- T-TIS-2: Schedule data import task
- T-TIS-3: Receive data import requests from C3DP
- T-TIS-4: Import from Osakidetza CDA service
- T-TIS-5: Import from RJH Open services
- T-TIS-6: Import from SWFT CSV files

The results of execution of each test case is provided in a dedicated sub-section below.

3.1 T-TIS-1 Register Patient

3.1.1 Execution description

The testers followed the following test steps in this test case:

1. View patient list
2. Choose to add new patient
3. Input test patient id and a random study id
4. Save patient
5. View patient list again and verify the new patient is in the list

3.1.2 Procedure result

The test has been completed with SUCCESS. No anomaly was observed during testing.

3.1.3 Incidents and other anomalous events

No incidents or other anomalous events were detected.

3.2 T-TIS-2 Schedule data import task

3.2.1 Execution description

The testers followed the following test steps in this test case:

11. View task list
12. Select 'Test Import Task'. This task is provided by WARWICK for local testing.
13. Input start time and repeat interval (e.g. every hour)
14. Select patients
15. Submit the task
16. View running task list and verify the new submitted task is in the list
17. At selected start time in step 3, verify the task is triggered in task execution log
18. At the time one repeat interval after the start time (both decided in step 3), verify the task is triggered in task execution log.

3.2.2 Procedure result

The test has been completed with SUCCESS. No anomaly was observed during testing.

3.2.3 Incidents and other anomalous events

No incidents or other anomalous events were detected.

3.3 T-TIS-3: Receive data import requests from C3DP

3.3.1 Execution description

The testers followed the following test steps in this test case:

18. C3DP requests patient data update by sending an HTTP POST request
19. C3DP receives 200 OK when the request is accepted
20. View task execution log in TIS-UI to verify the requested import task is triggered
21. View patient data in C3DP to verify the data is updated

3.3.2 Procedure result

The test has been completed with SUCCESS. No anomaly was observed during testing.

3.3.3 Incidents and other anomalous events

No incidents or other anomalous events were detected.

3.4 T-TIS-4: Import from Osakidetza CDA service

3.4.1 Execution description

The testers followed the following test steps in this test case:

5. View task list
6. Select task “Osakidetza CDA Service”
7. Input start time now and repeat none
8. Submit the task
9. View task execution log to verify the task is triggered
10. View patient data in C3DP to verify data is imported

3.4.2 Procedure result

The test has been completed with SUCCESS. No anomaly was observed during testing.

3.4.3 Incidents and other anomalous events

No incidents or other anomalous events were detected.

3.5 T-TIS-5: Import from RJH Open services

3.5.1 Execution description

The testers followed the following test steps in this test case:

8. View task list
9. Select task “RJH Open Services”
10. Input start time now and repeat none
11. Submit the task
12. View task execution log to verify the task is triggered
13. View patient data in C3DP to verify data is imported

3.5.2 Procedure result

The test has been completed with SUCCESS. No anomaly was observed during testing.

3.5.3 Incidents and other anomalous events

No incidents or other anomalous events were detected.

3.6 T-TIS-6: Import from SWFT CSV files

3.6.1 Execution description

The testers followed the following test steps in this test case:

1. View task list
2. Select task “SWFT CSV Files”
3. Input start time now and repeat none
4. Submit the task
5. View task execution log to verify the task is triggered
6. View patient data in C3DP to verify data is imported

3.6.2 Procedure result

The test has been completed with SUCCESS. No anomaly was observed during testing.

3.6.3 Incidents and other anomalous events

No incidents or other anomalous events were detected.

4 CONCLUSION

All test cases have been completed with SUCCESS. Some minor issues were identified during first iterations of the testing. They were mainly due to the data content anomalies exposed by the test system of the pilot sites or FHIR structure requirements imposed by C3DP. The issues were fixed quickly, so that they were retested successfully during later iterations of the testing. Any issues being detected during the component testing were documented and analysed. Related parties were notified with fix suggestions when the root cause was identified. While most of the bugs were minor and were resolved quickly through email or video conferencing, more severe technical issues or longer term feature requests are managed using the GitLab Issue Tracker system. GitLab is the main tool of the project for source version control.

10.2.5 SIS Test Results



C3-Cloud

“A Federated Collaborative Care Cure Cloud Architecture for Addressing the Needs of Multi-morbidity and Managing Poly-pharmacy”

PRIORITY Objective H2020-PHC-25-2015 - Advanced ICT systems and services for integrated care

Semantic Interoperability Suite (SIS) Component Test Results

Work Package: WP9 Evaluation and Assessment
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Document Leader: INSERM

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Dissemination Level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	
EU-RES	Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)	
EU-CON	Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)	
EU-SEC	Classified Information: SECRET UE (Commission Decision 2005/444/EC)	

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1 INTRODUCTION

1.1 Background

This current test results document is for reporting the component testing results of the C3-Cloud Semantic Interoperability Suite (SIS) component.

1.2 Objectives of the Test Results

The test result objectives are:

- present the tests run on the component;
- report the results of component testing;
- report any event that occurred during the testing process that requires investigation;
- explain the impact of the detected anomalies on the component;
- explain how the detected anomalies are managed as incident reports and how they are taken into account in the component update cycle.

This document merges the following test document templates of the IEEE Std 829-1998 - Standard for Software Test Documentation Deliverables:

- Component Test Procedure
- Component Test Log
- Component Test Incident Report
- Component Test Summary Report

1.3 Objectives of the Component Test

Check and verify that the implemented component functionalities meet the specified requirements. The technical requirements were first created in tasks T3.2 and T3.3 and have been updated a few times as part of task T3.4.

1.4 References

Standards and deliverables:

- IEEE Standard 829-1998, Standard for Software Test Documentation Deliverables
- D3.2 “Requirements Specification of the C3-Cloud Architecture”
- D3.3 “Conceptual Design of the C3-Cloud Architecture”
- D6.2 “Semantic Interoperability Suite Platform”
- D8.1 “Use Cases and Requirement Specifications of the Pilot Application”
- D9.1 “Functional and Non-Functional Testing Criteria for C3-Cloud Components”

Within the scope of Task 3.4, the Pilot Application Requirements (PARs) of D8.1 and the Requirements Traceability Matrix (RTM) of D3.2 and D3.3 have been reviewed and updated by May 2018.

2 TEST DATA

The SIS handles both structural mappings among different information models and resolves semantic mismatches due to the use of different terminology systems and different compositional aggregations, used to represent the same clinical concept. The test data that is used in SIS component testing is composed of the following:

- Input coded value and local terminologies provided by pilot sites
- Associated terminologies and mapping tables
- Pivot CDSM concepts issued from guidelines
- FHIR resources corresponding to medical data samples provided by pilot sites

3 TEST EXECUTION

The following test cases have been executed with the involvement of the test team presented in the Test Plan and Design document. Due to local implications of terminologies used, the SIS is developed in close relation with the pilot sites. There has not been any change in the environmental testing setup described in the same plan document:

- T-SIS-1': Retrieve semantic mapping corresponding to the input coded value
- T-SIS-2': Retrieve FHIR resource corresponding to the input local medical data
- T-SIS-3': Create new terminology mapping
- T-SIS-4': Register new terminology definition

The results of execution of each test case are provided in a dedicated sub-section below.

3.1 T-SIS-1' Retrieve semantic mapping corresponding to the input coded value

3.1.1 Execution description

The testers followed the following test steps in this test case:

1. Access the Web-based UI at <http://cispro.chu-rouen.fr/c3-cloud/>
2. Fill the form (from which site, for what code and to which site?)
3. Launch the Post request to get the generated URI and server response

3.1.2 Procedure result

The test has been completed with SUCCESS. No incident or anomalies were observed during testing.

3.2 T-SIS-2' Retrieve FHIR resource corresponding to the input local medical data

3.2.1 Execution description

The testers followed the following test steps in this test case:

1. Launch Postman collection
2. Launch REST requests for the SIS Structural Mapper via the Postman collection containing the medical test data provided by the pilot sites

3.2.2 Procedure result

The test has been completed with SUCCESS. No incident or anomalies were observed during testing.

3.3 T-SIS-3' Create new terminology mapping

3.3.1 Execution description

The testers followed the following test steps in this test case:

1. Launch Postman collection
2. Launch REST request collection to create the new terminology mapping

3.3.2 Procedure result

The test has been completed with SUCCESS. No incident or anomalies were observed during testing.

3.4 T-SIS-4' Register new terminology definition

3.4.1 Execution description

The testers followed the following test steps in this test case:

1. Launch the script to upload the new defined terminology and associated clinical concept mapping sheet

3.4.2 Procedure result

The test has been completed with SUCCESS. No incident or anomalies were observed during testing.

4 CONCLUSION

All test cases have been completed with SUCCESS. No incident or anomalies were observed during SIS component testing. Test executions related to both the Structural Mapper and Semantic Mapper expose a REST API for integration with other C3-Cloud components. In addition a simple user interface has been developed for the Semantic Mapper as well. This Web-based UI is available at <http://cispro.chu-rouen.fr/c3-cloud/>, where it is possible to review the existing mappings, build HTTP GET mapping requests and see the server's response. The test executions were performed during the M18 (December 2017) project review meeting, they were retested successfully.

10.2.6 SPS Test Results



C3-Cloud

“A Federated Collaborative Care Cure Cloud Architecture for Addressing the Needs of Multi-morbidity and Managing Poly-pharmacy”

PRIORITY Objective H2020-PHC-25-2015 - Advanced ICT systems and services for integrated care

Security and Privacy Suite (SPS) Component Test Results

Work Package: WP9 Evaluation and Assessment
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 Project End Date: 30 April 2020
 Project Duration: 48 months
Document Leader: SRDC

Project funded by the European Commission within the Horizon 2020 Programme (2014-2020)		
Dissemination Level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	
EU-RES	Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)	
EU-CON	Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)	
EU-SEC	Classified Information: SECRET UE (Commission Decision 2005/444/EC)	

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v0.2	04-06-2018	Complete version	SRDC	Task 9.2

Contributors (Benef.)	Gokce Banu Laleci Erturkmen, Mustafa Yuksel, Bunyamin Sarigul (SRDC)			
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1 INTRODUCTION

1.1 Background

This current test results document is for reporting the component testing results of the C3-Cloud Security and Privacy Suite (SPS) component.

1.2 Objectives of the Test Results

The test result objectives are:

- present the tests run on the component;
- report the results of component testing;
- report any event that occurred during the testing process that requires investigation;
- explain the impact of the detected anomalies on the component;
- explain how the detected anomalies are managed as incident reports and how they are taken into account in the component update cycle.

This document merges the following test document templates of the IEEE Std 829-1998 - Standard for Software Test Documentation Deliverables:

- Component Test Procedure
- Component Test Log
- Component Test Incident Report
- Component Test Summary Report

1.3 Objectives of the Component Test

Check and verify that the implemented component functionalities meet the specified requirements. The technical requirements were first created in tasks T3.2 and T3.3 and have been updated a few times as part of task T3.4.

1.4 References

Standards and deliverables:

- IEEE Std 829-1998, Standard for Software Test Documentation Deliverables
- D3.2 “Requirements Specification of the C3-Cloud Architecture”
- D3.3 “Conceptual Design of the C3-Cloud Architecture”
- D8.1 “Use Cases and Requirement Specifications of the Pilot Application”
- D9.1 “Functional and Non-Functional Testing Criteria for C3-Cloud Components”

Within the scope of Task 3.4, the Pilot Application Requirements (PARs) of D8.1 and the Requirements Traceability Matrix (RTM) of D3.2 and D3.3 have been reviewed and updated by May 2018.

2 TEST DATA

The test data that is used in component testing is composed mainly of the following:

- reference care plan example and associated patient medical summary that is prepared and modelled in FHIR resources by technical partner SRDC,
- realistic care plan examples and associated patient medical summary provided by pilot sites and modelled in FHIR resources by SRDC,
- structural roles and access control policies provided by technical partner SRDC according to feedback by pilot sites,
- health professional user accounts created in C3-Cloud default Identity Provider.

3 TEST EXECUTION

The following test cases have been executed with the involvement of the test team presented in the Test Plan and Design document. There has not been any change in the environmental testing setup described in the same plan document:

- T-SPS-1: Create care team member account
- T-SPS-2: Authenticate care team member via existing business account
- T-SPS-3: Authenticate care team member via C3-Cloud account
- T-SPS-4: Authorise care team member
- T-SPS-5: Manage access control policies
- T-SPS-6: Store and view audit trail record

The results of execution of each test case is provided in a dedicated sub-section below.

3.1 T-SPS-1 Create care team member account

3.1.1 Execution description

The testers followed the following test steps in this test case:

1. Login to SPS manager with admin account
2. Click “Invite user” OR “Register user”
3. Enter new user information
4. New user is informed

3.1.2 Procedure result

The test has been completed with SUCCESS. One anomaly was observed as presented in detail in the next section. The impact of this was medium and it is already assigned for resolution by following the original software development cycle. Apart from these, no interrupting anomaly occurred.

3.1.3 Incidents and other anomalous events

ID	Description	Impact	Status
I-SPS-11	The user id was not set correctly in the user registration menu	High	Retested with fix confirmed
I-SPS-12	Could not test “invite user” completely. The functionality is there but currently no email server is setup for sending invitation email.	Medium	Assigned for resolution

3.2 T-SPS-2 Authenticate care team member via existing business account

3.2.1 Execution description

The testers followed the following test steps in this test case:

1. Open C3DP login page
2. Select Identity Provider (IdP) from the list
3. When forwarded to the corresponding login page of the IdP, enter username and password
4. User is redirected to C3DP upon successful login

3.2.2 Procedure result

The test has been completed with SUCCESS. Currently only RJH ADFS is integrated with the C3-Cloud SPS via the OpenID Connect 1.0 endpoint. Integration with Basque Country will be initiated

soon and there will be no integration with SWFT. In RJH, the authentication works fine. SPS can get most attributes of the user like name and surname; however, the role and business identifier attributes are missing. RJH staff is aware of this problem for a long time. Apart from this, no interrupting anomaly occurred during testing.

3.2.3 Incidents and other anomalous events

ID	Description	Impact	Status
I-SPS-21	The role and business id attributes are missing in the token provided by the RJH ADFS OpenID Connect endpoint	High	Assigned for resolution

3.3 T-SPS-3 Authenticate care team member via C3-Cloud account

3.3.1 Execution description

The testers followed the following test steps in this test case:

1. Open C3DP login page
2. Select C3-Cloud Identity Provider (IdP) from the list
3. When forwarded to the corresponding login page of the C3-Cloud IdP, enter username and password
4. User is redirected to C3DP upon successful login

3.3.2 Procedure result

The test has been completed with SUCCESS. No anomaly was observed during testing.

3.3.3 Incidents and other anomalous events

No incidents or other anomalous events were detected.

3.4 T-SPS-4 Authorise care team member

3.4.1 Execution description

The testers followed the following test steps in this test case:

1. User tries to perform a CRUD operation on a care plan in C3DP
2. If the user has sufficient privileges (e.g. a doctor trying to update a care plan), she is allowed to do so
3. If the user does not have sufficient privileges (e.g. a nurse assistant trying to update a care plan), then she is informed accordingly

3.4.2 Procedure result

The test has been completed with SUCCESS. One anomaly with low impact was detected and in fact this is not directly related with SPS. SPS correctly informs C3DP when a user does not have the sufficient privileges to perform a specific operation, but C3DP does not inform the user in a user-friendly manner according to SPS response. This anomaly has low impact and it has already been assigned for resolution by following the original software development cycle.

3.4.3 Incidents and other anomalous events

ID	Description	Impact	Status
I-SPS-41	The authorisation functionality works without a problem but when the user does not have sufficient privileges, C3DP does not inform the user in a user-friendly manner	Low	Assigned for resolution

3.5 T-SPS-5 Manage access control policies

3.5.1 Execution description

The testers followed the following test steps in this test case:

1. Login to SPS manager with admin account
2. Click “Access policy”
3. View the access control permissions per FHIR resource and per user role
4. Update any permission
5. Save

3.5.2 Procedure result

The test has been completed with SUCCESS. No anomaly was observed during testing.

3.5.3 Incidents and other anomalous events

No incidents or other anomalous events were detected.

3.6 T-SPS-6 Store and view audit trail record

3.6.1 Execution description

The testers followed the following test steps in this test case:

1. Perform any CRUD operation on any patient data (either via C3DP, PEP or TIS)
2. C3-Cloud FHIR Repository automatically creates the corresponding audit trail record
3. Login to SPS manager with admin account
4. Click on “Access logs”
5. View audit trail records and filter according to needs

3.6.2 Procedure result

The test has been completed with SUCCESS. Some anomalies were observed as presented in detail in the next section. The impact of these were either medium or low, and they have either been already fixed and retested with success or analysed and assigned for resolution by following the original software development cycle. Apart from these, no interrupting anomaly occurred.

3.6.3 Incidents and other anomalous events

ID	Description	Impact	Status
I-SPS-61	The date picker in the search menu is problematic, it cannot capture the dates in a single click	Low	Retested with fix confirmed
I-SPS-62	Filtering audit trail record queries do not work as expected. The filtering parameters might better be forwarded to the FHIR Repository instead of trying to get first resources and then filtering on	Medium	Assigned for resolution

	the client side.		
I-SPS-63	At first login, the count parameter in the left-hand menu is not set automatically, which causes an exception in the following search queries	Low	Assigned for resolution

4 CONCLUSION

All test cases have been completed with SUCCESS. Some anomalies with mostly low or medium and very rarely high impact were detected, but some of them were already fixed during the active component testing session, so that they were retested successfully.

The anomalies detected during component testing have first been noted down, when known with the original cause of the anomaly. Then corresponding incident records have been created. SRDC prefers GitLab Issue Tracker that is automatically integrated with the software source code base for issue management, and Asana for higher-level task management among the team members.

Following identification, detailed analysis of the issues by the development team has taken place. Some of the reported incidents have already been fixed and retested during the component testing phase as already reported in the incident tables of the previous section. The remaining incidents have already been assigned for resolution and will be fixed in the upcoming weeks. They will continue to be tracked via the incidents available in SRDC GitLab Issue Tracker.

10.3 Appendix 3 Application Testing by MDTs

Questionnaires and Responses from the Multi-Disciplinary Team Members when using the C3DP.

DESCRIPTION AND REPORTING OF MDTs RESPONSES FOR C3-CLOUD “APPLICATION TESTING”

Overall, 22 MDTs from all three pilot sites (SWFT, BC and RJH) participated to the Application Testing of the C3DP. Before the testing, training sessions were performed with participants using the walkthrough document.

Below is the detailed description and report of responses including:

- Formulated application testing question
- Participant’s response with YES, NO and NA (for functionalities which were Not Available / Not Accessible). All data are expressed as a percentage.
- Table listing possible MDT comments when the response is NO. The MDT had possibilities to specify and explain the problem faced by writing free text comments.

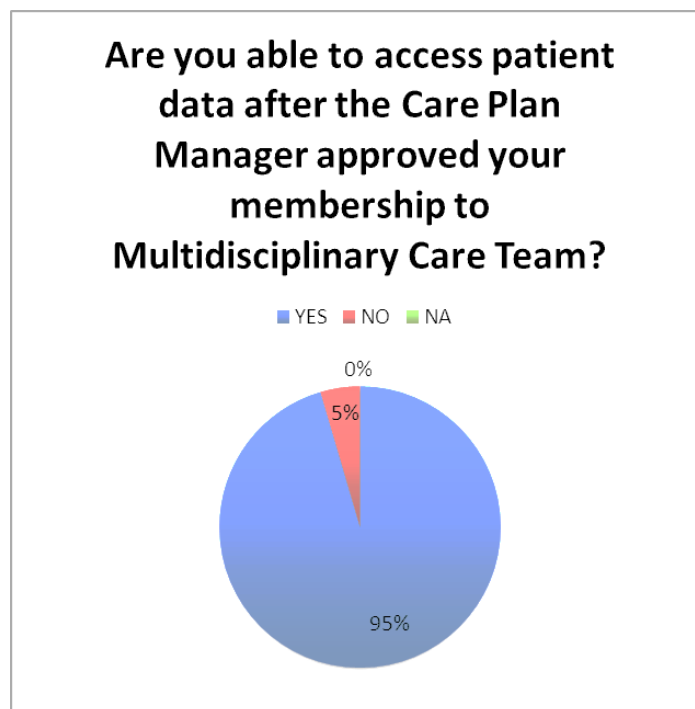


Figure 1: Are you able to access patient data after the Care Plan Manager approved your membership to Multidisciplinary Care Team?

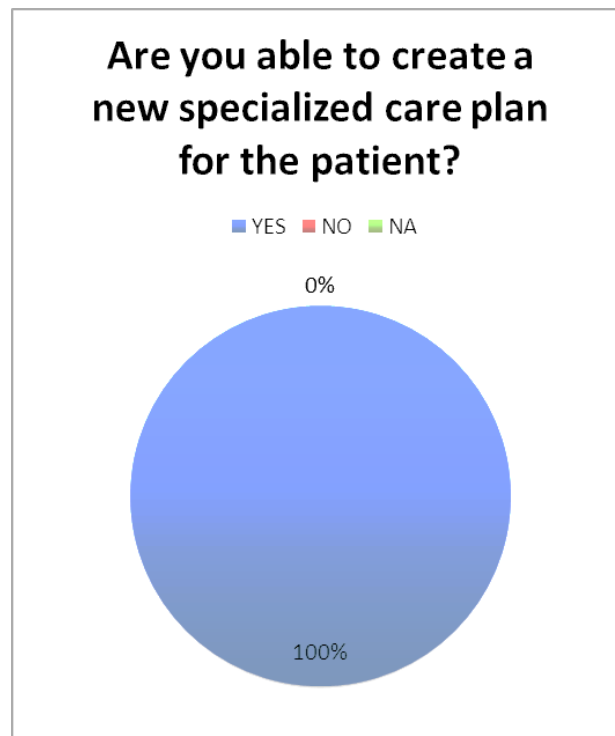


Figure 2: Are you able to create a new specialized care plan for the patient?

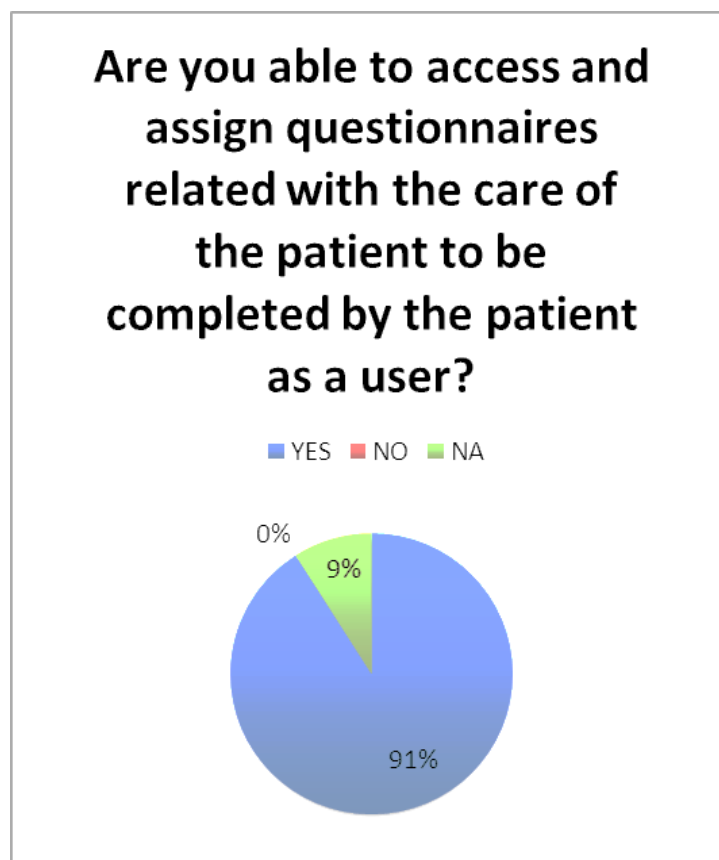


Figure 3: Are you able to access and assign questionnaires related with the care of the patient to be completed by the patient as a user?

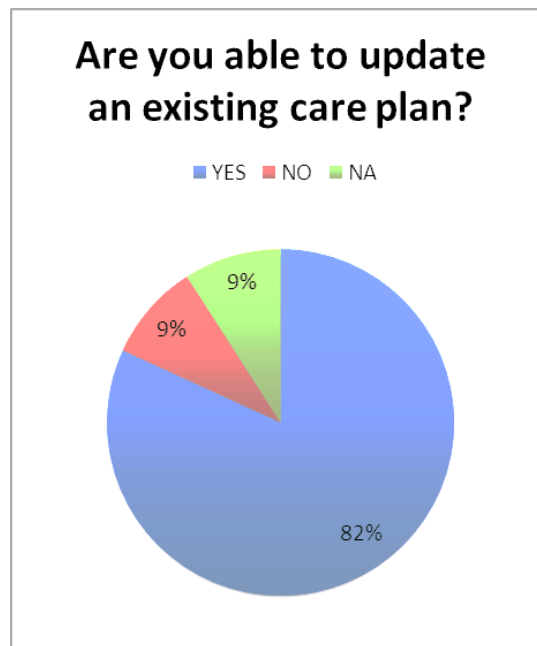


Figure 4: Are you able to update an existing care plan?

Table 1: Are you able to update an existing care plan?

I am able to update an existing care plan in terms of goals and activities but I am not able to update a new health condition to the care plan.

I can update some elements of the plan as goals and activities and training material, but I cannot update the health conditions of the patient.

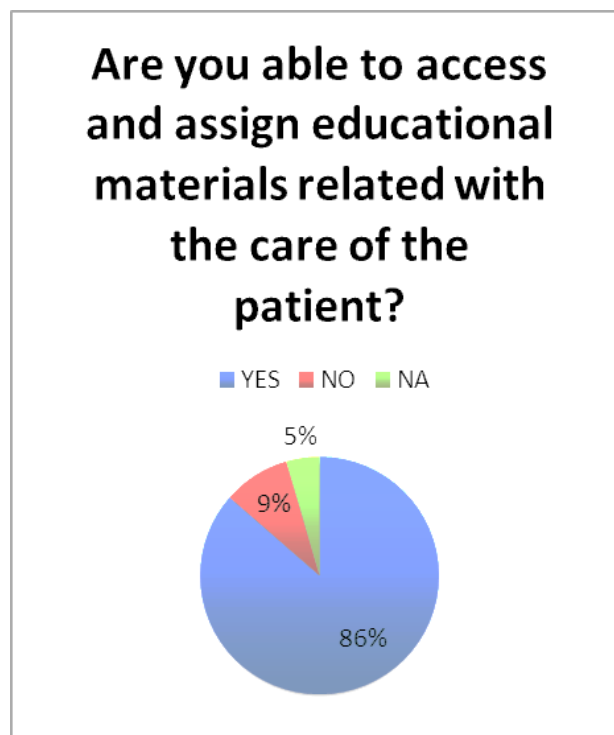
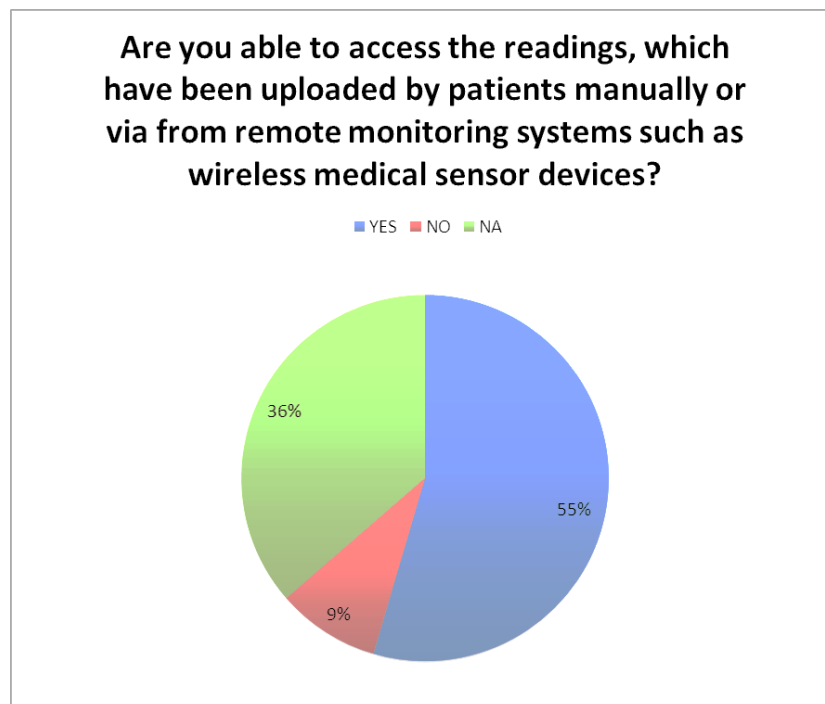


Figure 5 : Are you able to access and assign educational materials related with the care of the patient?

Table 2: Are you able to access and assign educational materials related with the care of the patient?

Not recorded
No recorded

**Figure 6: Are you able to access the readings, which have been uploaded by patients manually or via from remote monitoring systems such as wireless medical sensor devices?****Table 3 Are you able to access the readings, which have been uploaded by patients manually or via from remote monitoring systems such as wireless medical sensor devices?**

Not recorded
Did not find them...

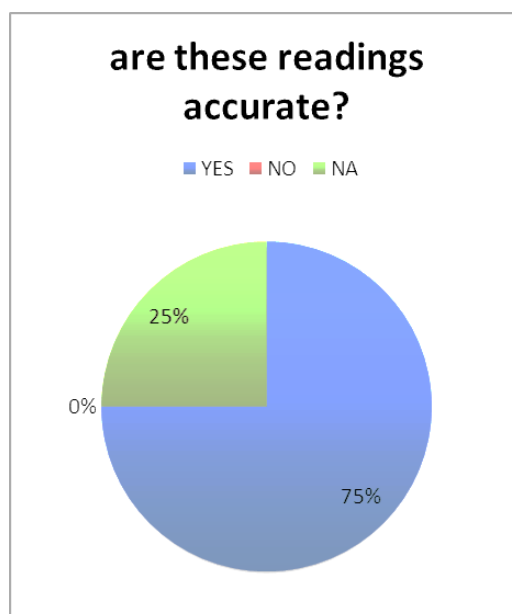


Figure 7: Are these readings accurate?

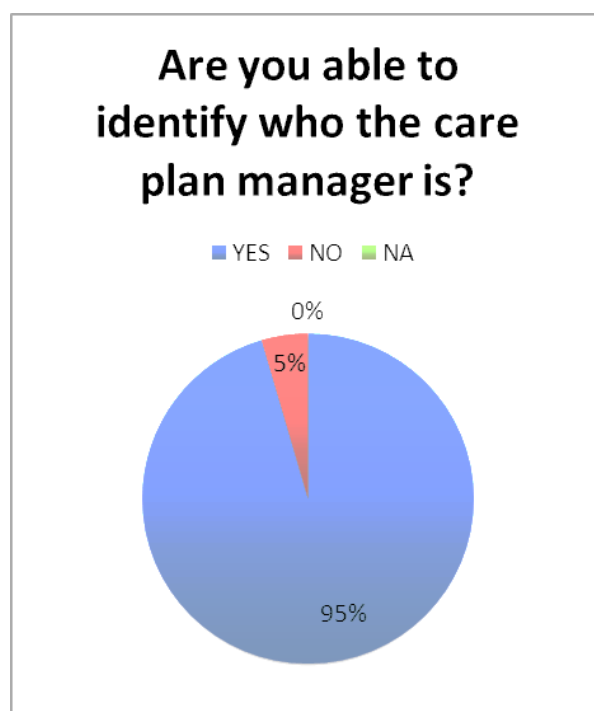


Figure 8: Are you able to identify who the care plan manager is?

Table 4: Are you able to identify who the care plan manager is?

Don't know where to find it neither where to register it
--

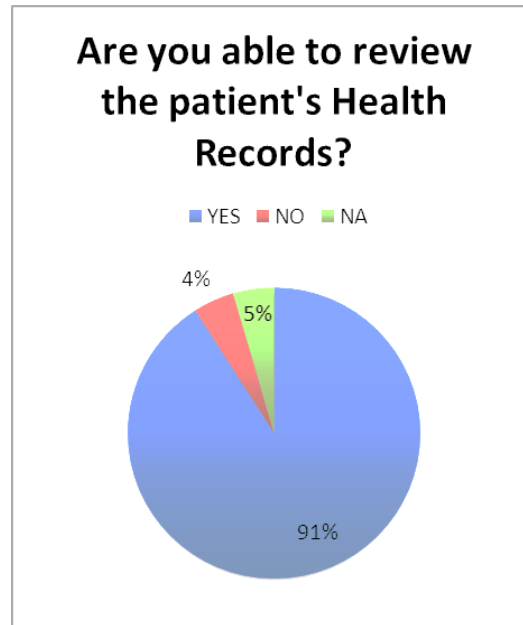


Figure 9: Are you able to review the patient's Health Records?

Table 5: Are you able to review the patient's Health Records?

Not sure what you mean by that. I can easily access pt's medical summary. If that is the focus of the question, then my answer is "yes"

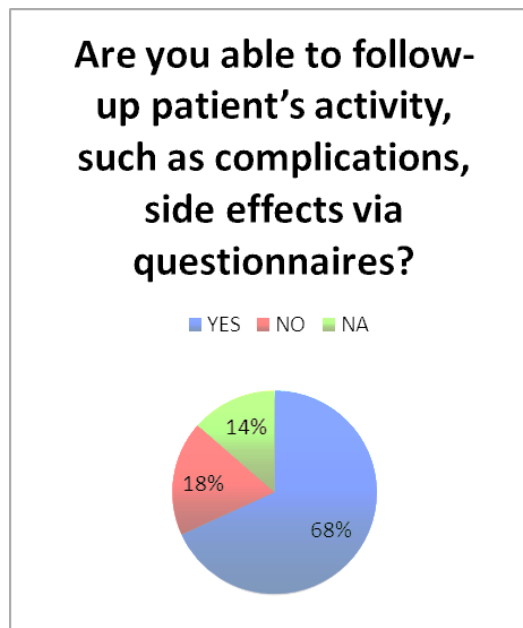


Figure 10: Are you able to follow-up patient's activity, such as complications, side effects via questionnaires?

Table 6: Are you able to follow-up patient's activity, such as complications, side effects via questionnaires?

Not noted

Side effects questionnaire didn't pass through from C3DP
Side effects questionnaire didn't pass through
I haven't tried it... but to be honest, I don't know where to find it. Should they show at patient data screen, then my answer would be "yes"

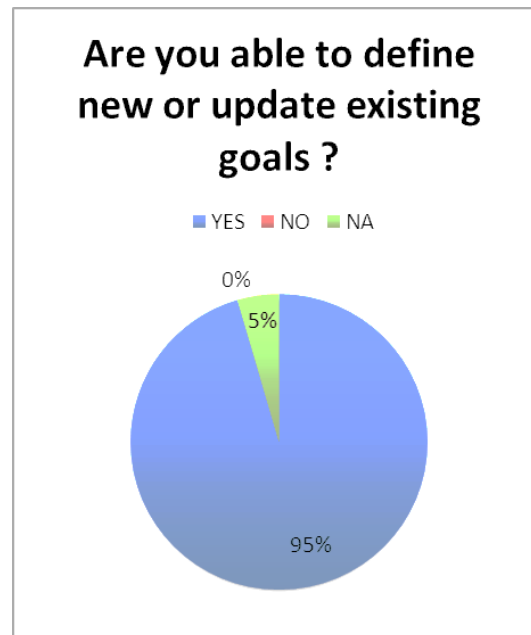


Figure 11: Are you able to define new or update existing goals?

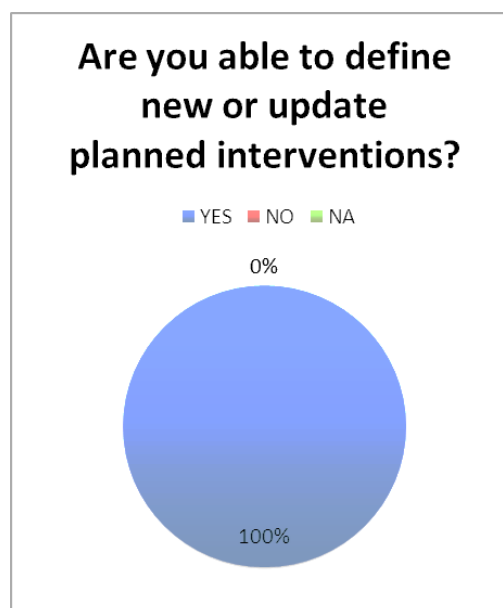


Figure 12: Are you able to define new or update planned interventions?



Figure 13: Are you able to define new or update self-care activities (like exercise recommendation)?

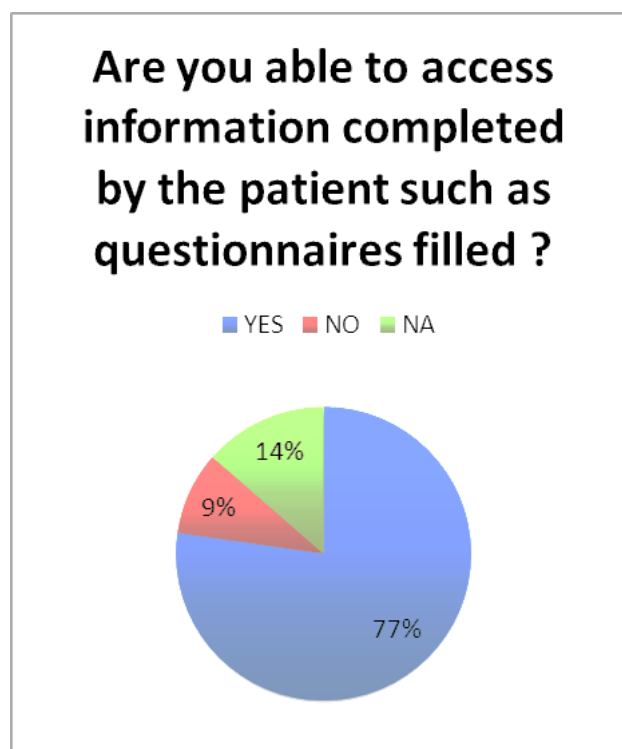


Figure 14: Are you able to access information completed by the patient such as questionnaires filled?

Table 7: Are you able to access information completed by the patient such as questionnaires filled?

Not recorded
Didn't pass through from PEP

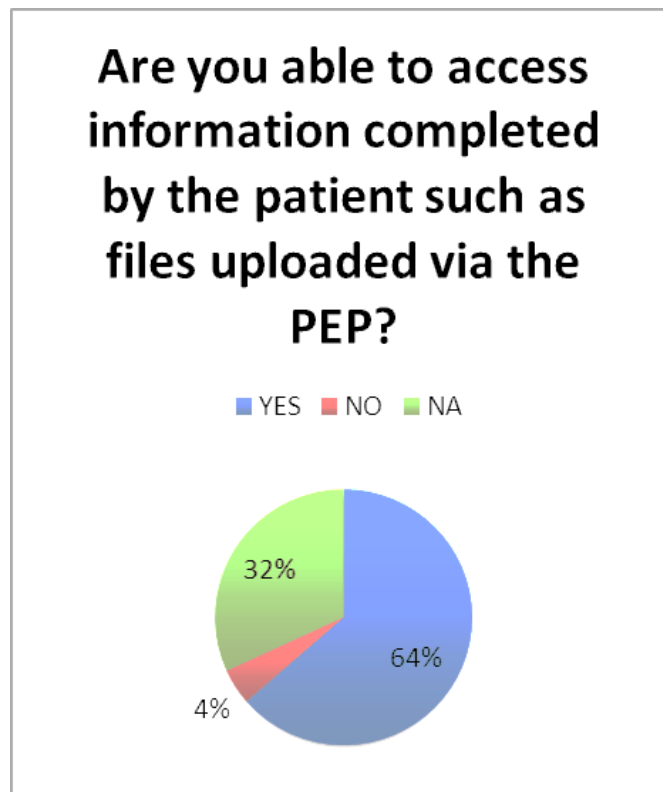


Figure 15: Are you able to access information completed by the patient such as files uploaded via the PEP?

Table 8: Are you able to access information completed by the patient such as files uploaded via the PEP?

Not recorded

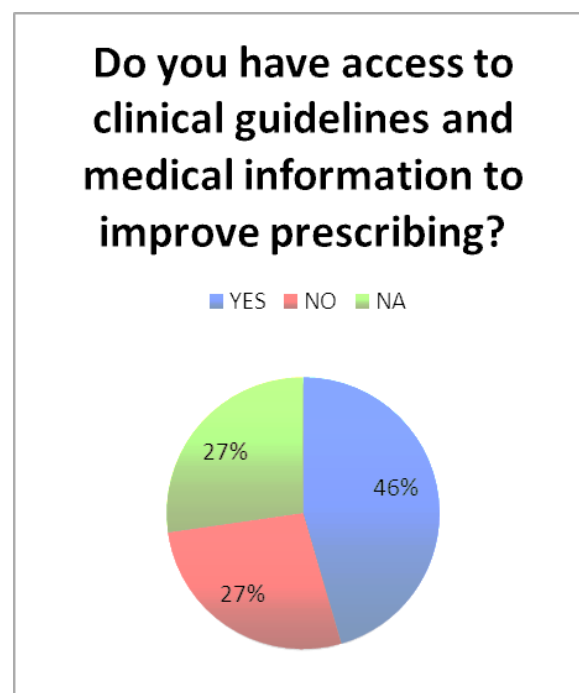
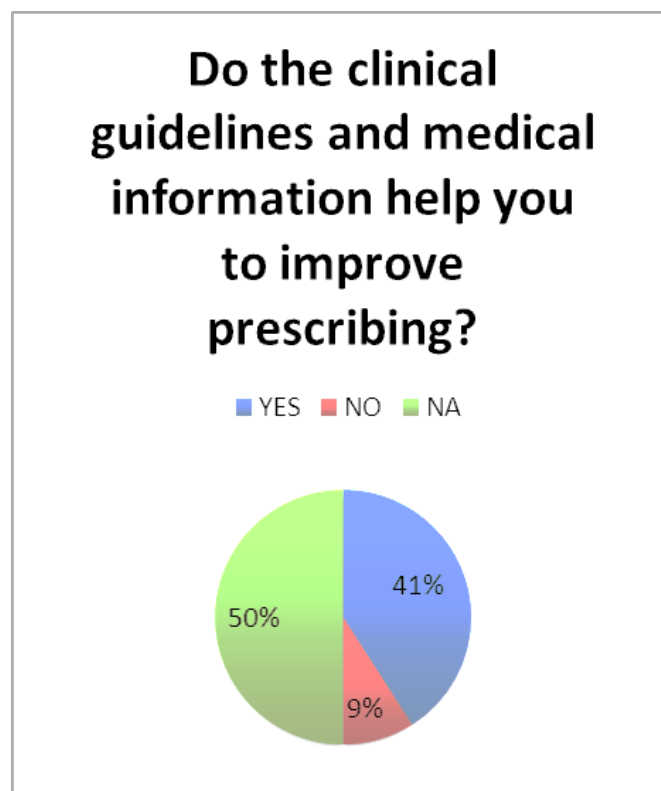


Figure 16: Do you have access to clinical guidelines and medical information to improve prescribing?

Table 9: Do you have access to clinical guidelines and medical information to improve prescribing?

Couldn't find any
Cant find them
Couldn't find them
There are no guidelines available or I have not been able to find them
I don't have access to any clinical guideline.
I have not found clinical guidelines and/or medical information in the platform.

**Figure 17: Do the clinical guidelines and medical information help you to improve prescribing?****Table 10: Do the clinical guidelines and medical information help you to improve prescribing?**

Needs improvement/refinement in what is listed
Cant find them

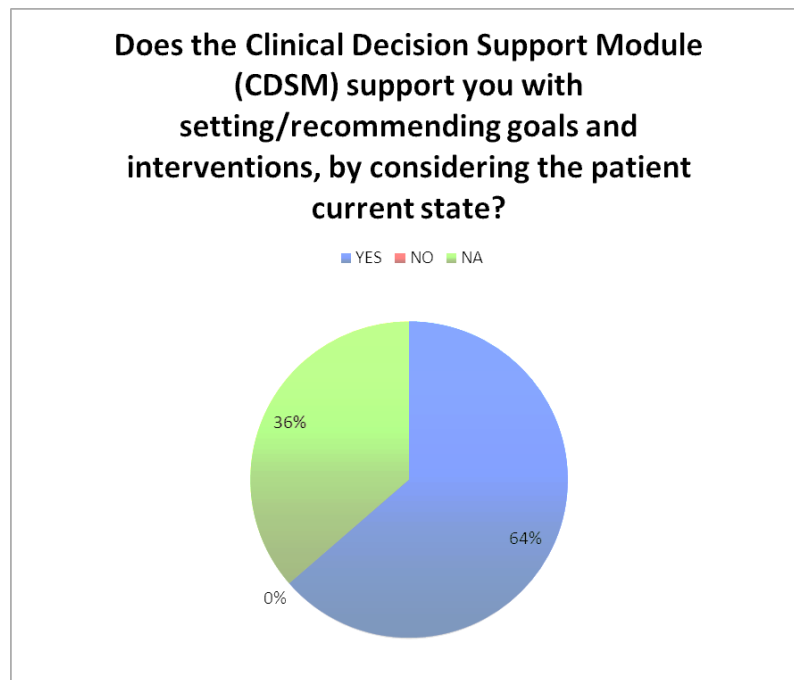


Figure 18: Does the Clinical Decision Support Module (CDSM) support you with setting/recommending goals and interventions, by considering the patient current state?

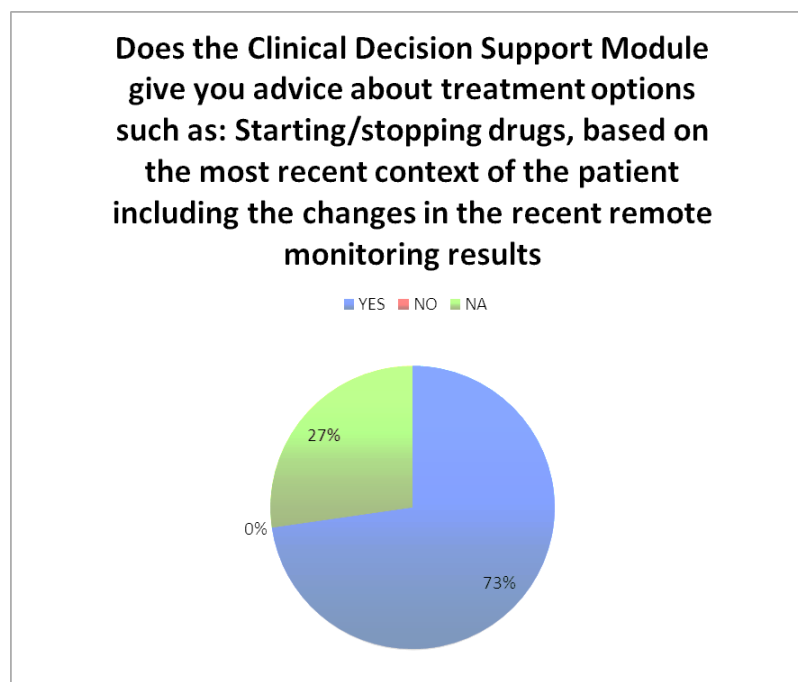


Figure 19: Does the Clinical Decision Support Module give you advice about treatment options such as: Starting/stopping drugs, based on the most recent context of the patient including the changes in the recent remote monitoring results

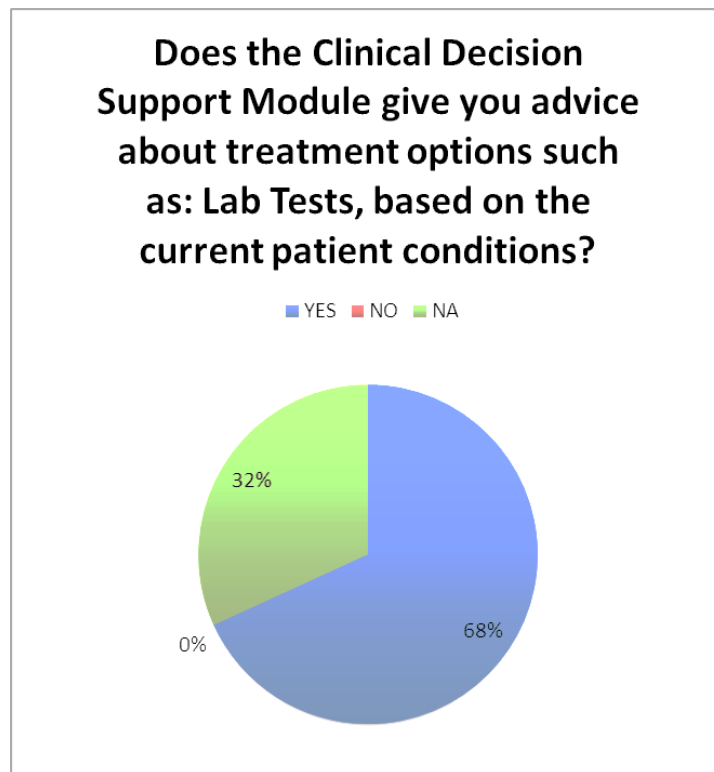


Figure 20: Does the Clinical Decision Support Module give you advice about treatment options such as: Lab Tests, based on the current patient conditions

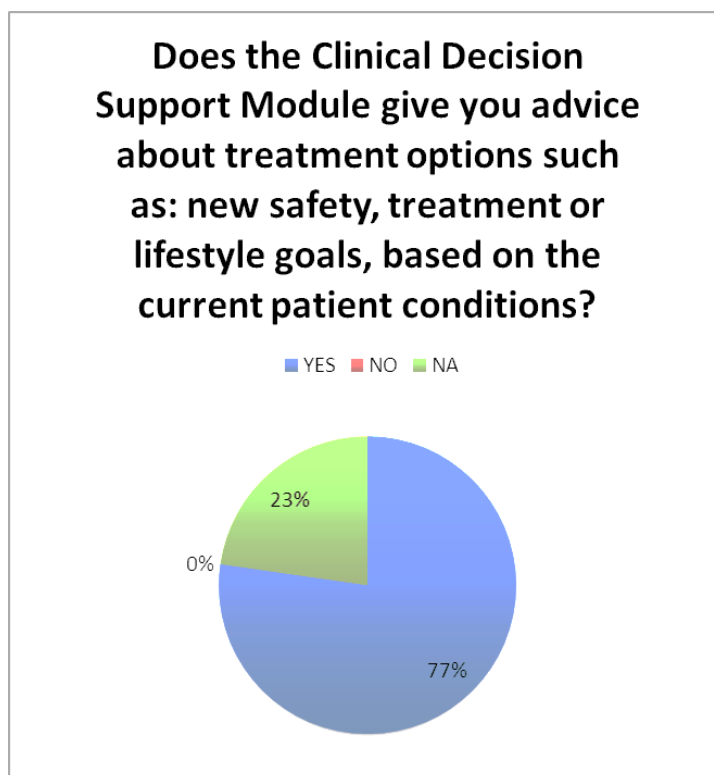


Figure 21: Does the Clinical Decision Support Module give you advice about treatment options such as: new safety, treatment or lifestyle goals, based on the current patient conditions?

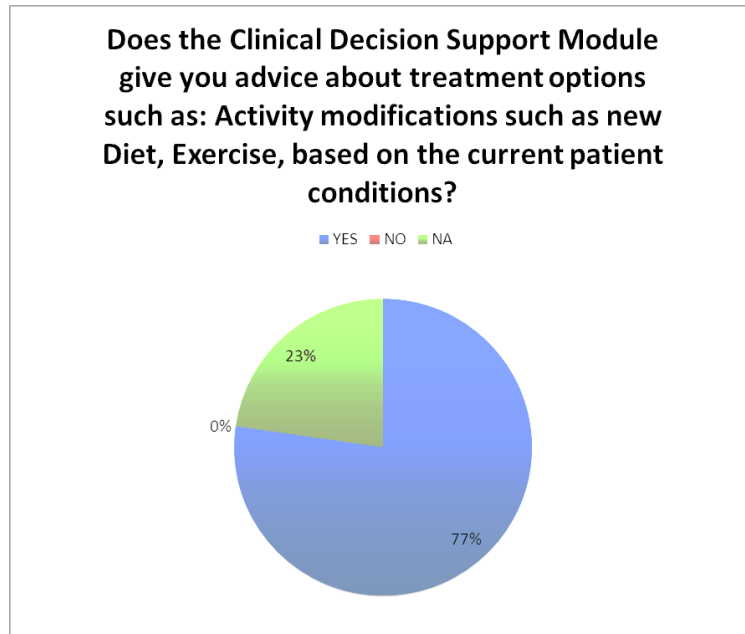


Figure 22: Does the Clinical Decision Support Module give you advice about treatment options such as: Activity modifications such as new Diet, Exercise, based on the current patient conditions?

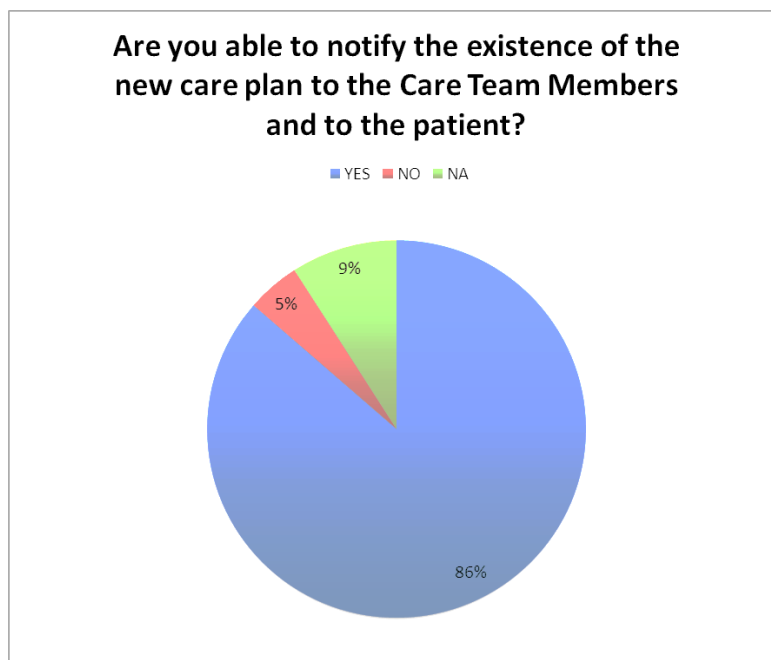


Figure 23: Are you able to notify the existence of the new care plan to the Care Team Members and to the patient?

Table 11 Are you able to notify the existence of the new care plan to the Care Team Members and to the patient?

I don't know how to do it

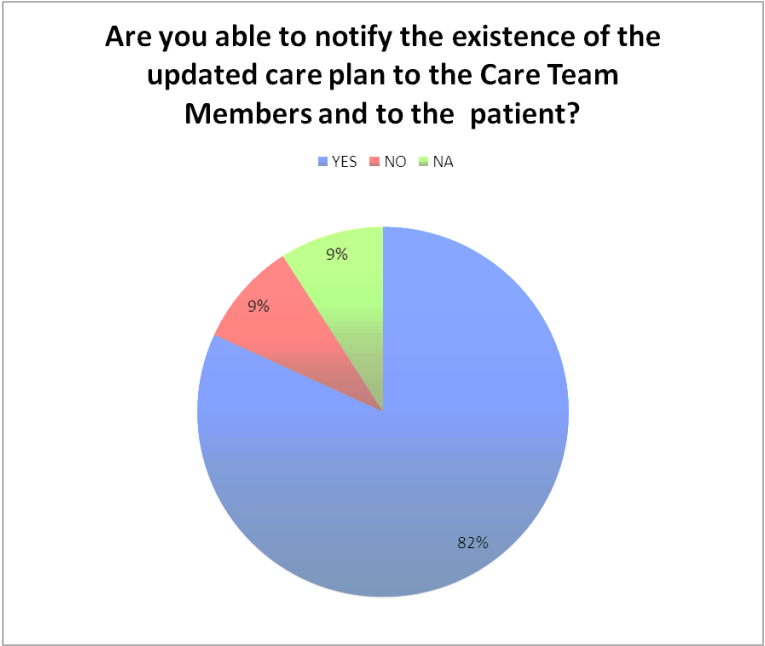


Figure 24: Are you able to notify the existence of the updated care plan to the Care Team Members and to the patient?

Table 12 Are you able to notify the existence of the updated care plan to the Care Team Members and to the patient?

I don ´t know how to do it
Unless it is just a matter of sending a message to all of them, I am not aware of any easier ways to do this...

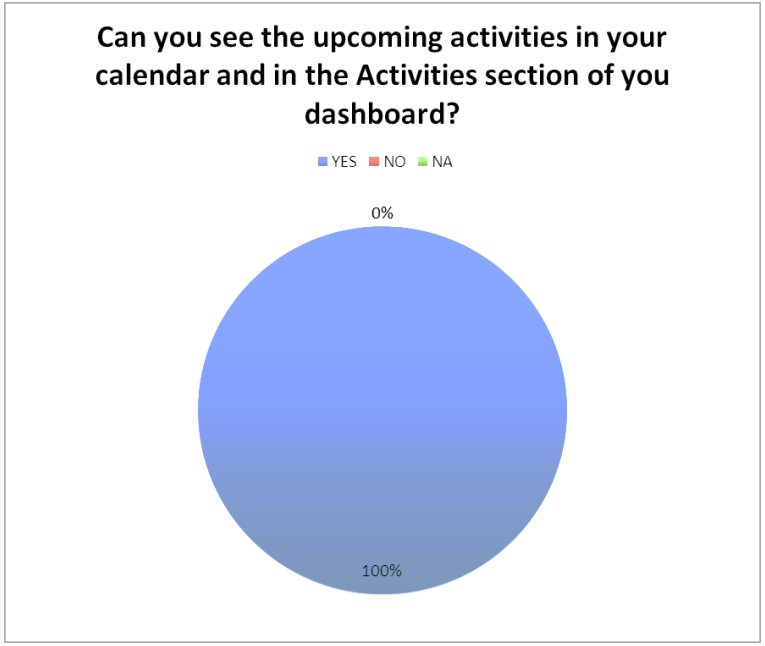


Figure 25: Can you see the upcoming activities in your calendar and in the Activities section of you dashboard?

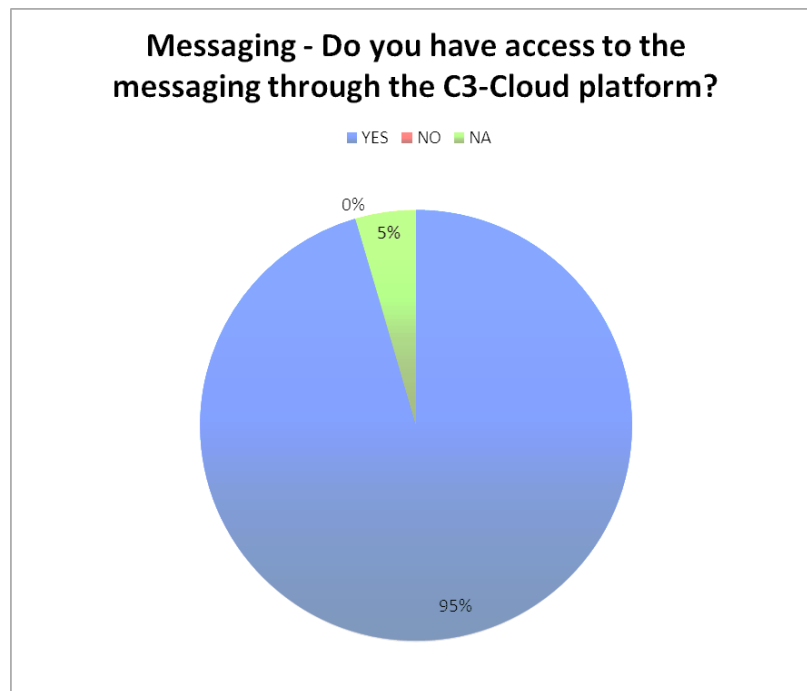


Figure 26: Messaging - Do you have access to the messaging through the C3-Cloud platform?



Figure 27: Messaging - Are you able to receive a message via messaging?

Table 13: Messaging - Are you able to receive a message via messaging?

I don't receive the patient's message

Messaging - Are you able to send a request to the system to be added as a Multidisciplinary Care Team member?

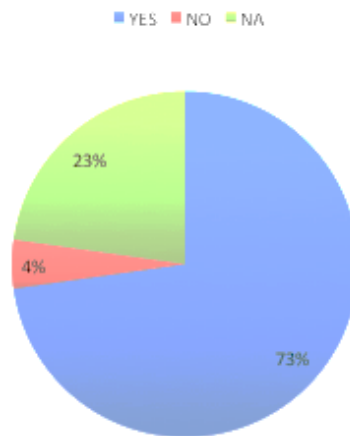


Figure 28: Messaging - Are you able to send a request to the system to be added as a Multidisciplinary Care Team member?

Table 14: Messaging - Are you able to send a request to the system to be added as a Multidisciplinary Care Team member?

No idea on how to do this

Messaging - Does the system enable you to receive a request from a non-Multidisciplinary Care Team member?

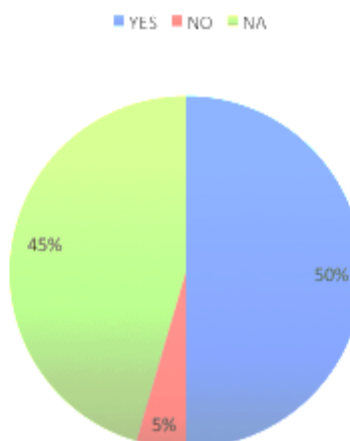
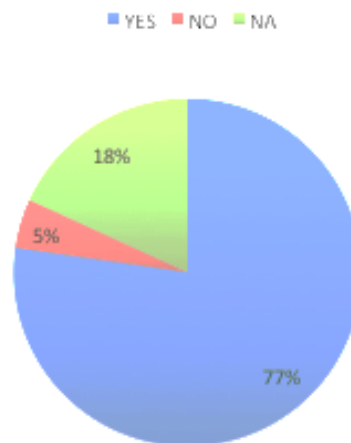


Figure 29: Messaging - Does the system enable you to receive a request from a non-Multidisciplinary Care Team member?

Table 15: Messaging - Does the system enable you to receive a request from a non-Multidisciplinary Care Team member?

Not available to test

Messaging - Are you able to send messages to the other members of Multidisciplinary Care Team via asynchronous messaging?

**Figure 30: Messaging - Are you able to send messages to the other members of Multidisciplinary Care Team via asynchronous messaging?****Table 16: Messaging - Are you able to send messages to the other members of Multidisciplinary Care Team via asynchronous messaging?**

Not available to test

Invitation - Are you able to invite another specialist to join the patient's Care Team?

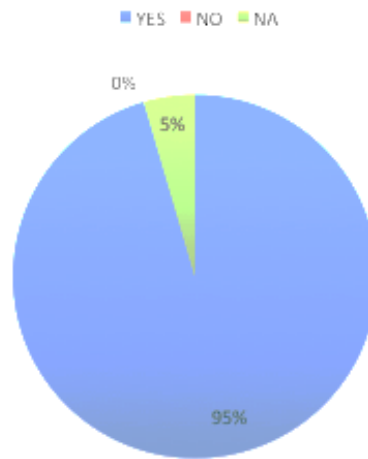


Figure 31: Invitation - Are you able to invite another specialist to join the patient's Care Team?

Invitation - Are you able to define the intervals (next scheduled) for future Care Plan Review Meetings and note them in the care plan definition?

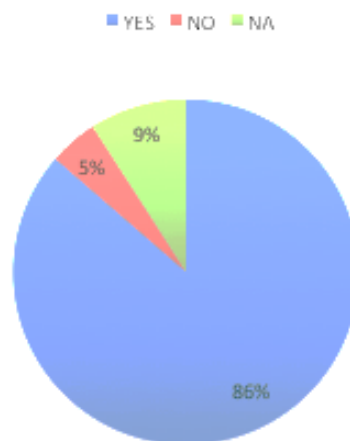


Figure 32: Invitation - Are you able to define the intervals (next scheduled) for future Care Plan Review Meetings and note them in the care plan definition?

Table 17: Invitation - Are you able to define the intervals (next scheduled) for future Care Plan Review Meetings and note them in the care plan definition?

Sorry, I did not get this far..

**Sharing - Can the other
multidisciplinary team members/
patient see the Care plan recently
updated by you?**

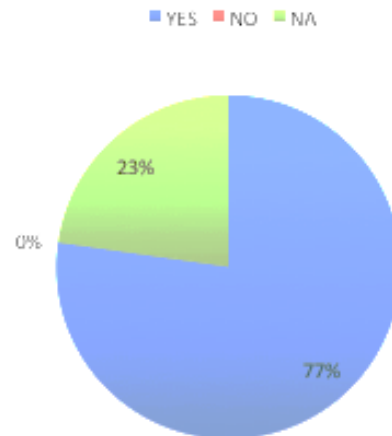


Figure 33: Sharing - Can the other multidisciplinary team members/patient see the Care plan recently updated by you?

10.4 Appendix 4 Application Testing by Patients

Questionnaires and Responses from Patient / Informal Care Givers when using the PEP.

DESCRIPTION AND REPORTING OF PATIENT AND INFORMAL CARE GIVER RESPONSES FOR C3-CLOUD “APPLICATION TESTING”

Overall, 26 patients and informal care givers (ICG) from all three pilot sites (SWFT, BC and RJH) participated to the Application Testing of the PEP. Before the testing, training sessions were performed with participants using the walkthrough document.

Below is the detailed description and report of responses including:

- Formulated application testing question
- Participant’s response with YES, NO and NA (for functionalities which were Not Available / Not Accessible). All data are expressed in percent
- Table listing possible MDT comments when the response is NO. The MDT had possibilities to specify and explain the problem faced by writing free text comments.

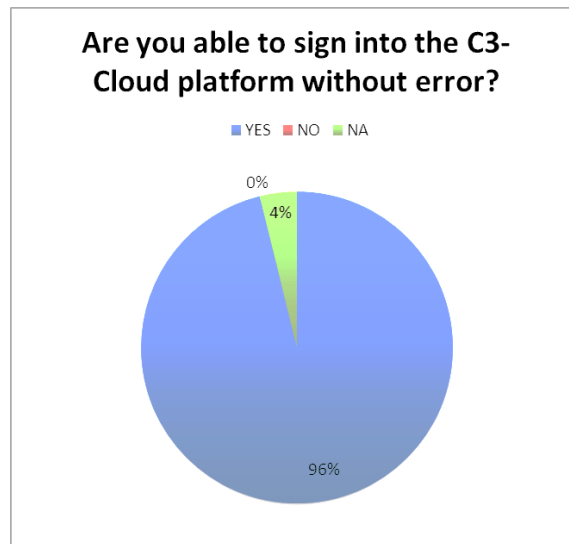


Figure 1: Are you able to sign into the C3-Cloud platform without error?

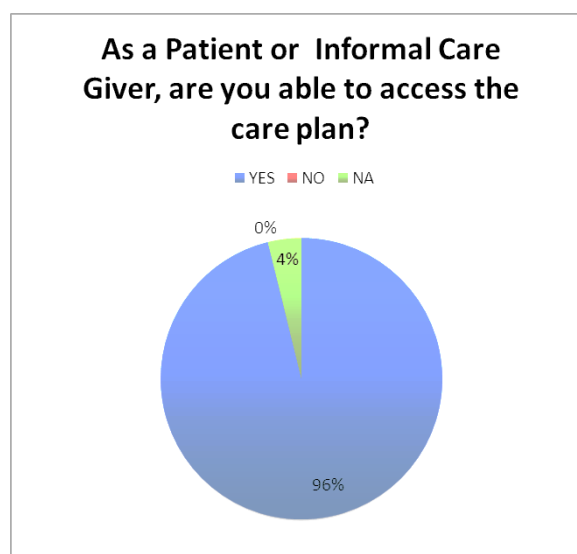


Figure 2: As a Patient or Informal Care Giver, are you able to access the care plan?

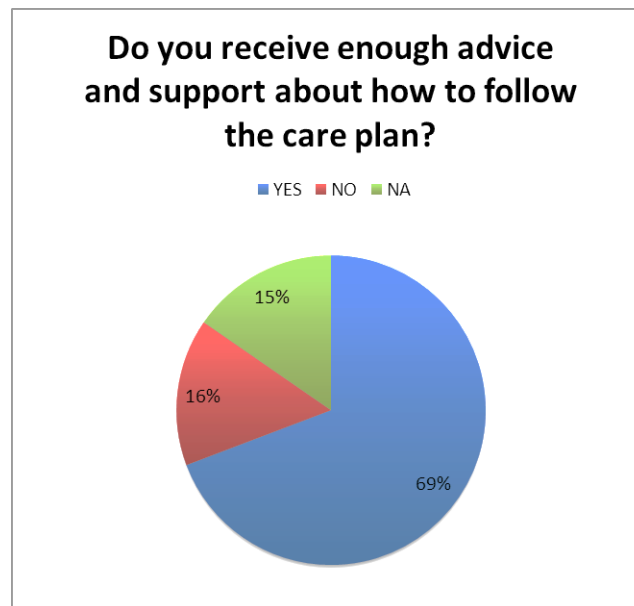


Figure 3: Do you receive enough advice and support about how to follow the care plan?

Table 1 : Do you receive enough advice and support about how to follow the care plan?

Not clear how to work through the system
Not obvious what needs to be done, when and how. Some guidance notes would be helpful
More time needed
Needs to be simpler with clear single click pathway through each of the components for the patient. A lot of the technical material in each patient activity not needed by patient and confusing

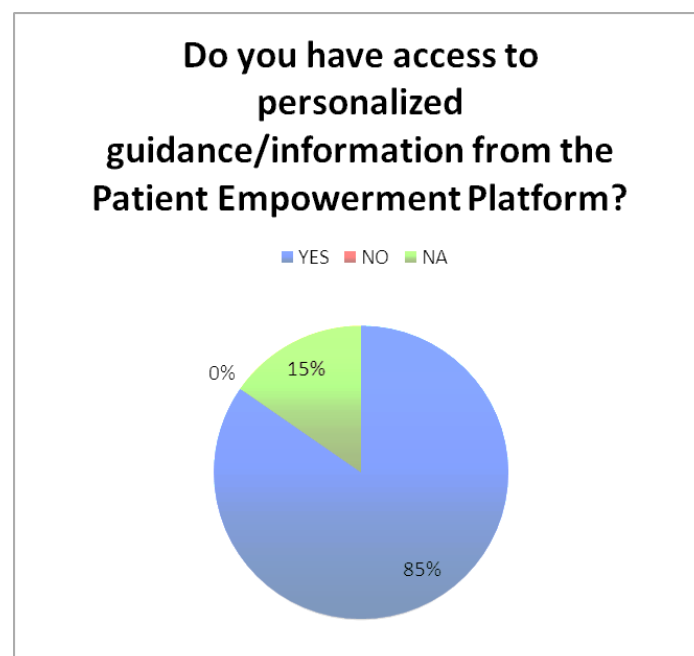


Figure 4: Do you have access to personalized guidance/information in the Patient Empowerment Platform?

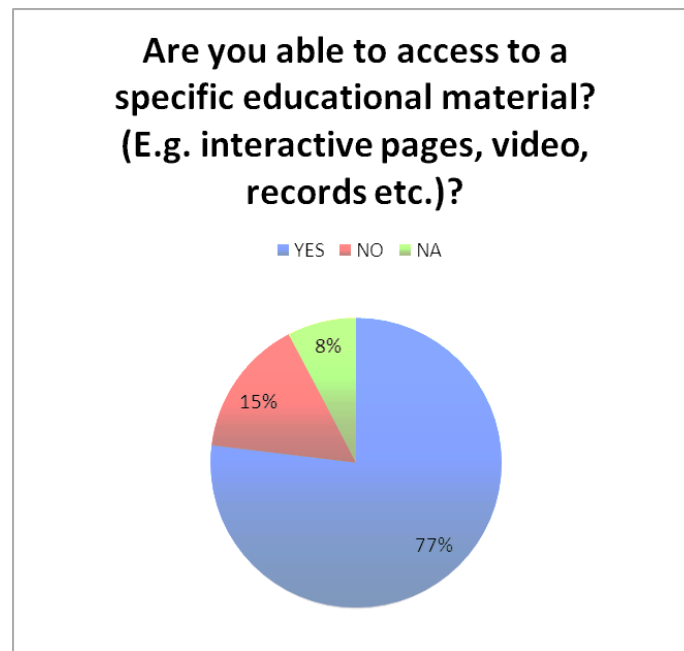


Figure 5: Are you able to access specific educational material? (E.g. interactive pages, video, records etc.)?

Table 2 : Are you able to access specific educational material? (E.g. interactive pages, video, records etc.)?

I don't feel it was personalised to me
Not recorded
Not recorded
Not sure where to find them

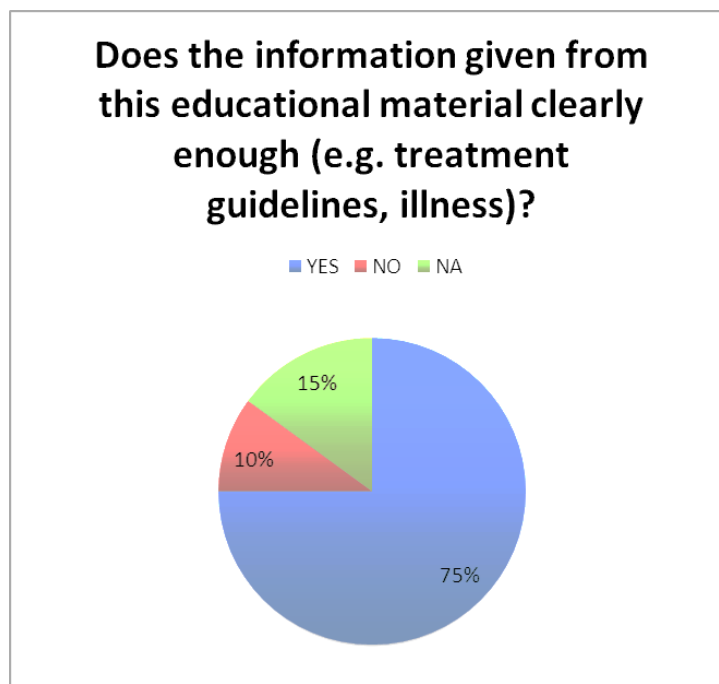


Figure 6: Does the information given from this educational material clearly enough (e.g. treatment guidelines, illness)?

Table 3 : Does the information given from this educational material clearly enough (e.g. treatment guidelines, illness)?

In the training session and with the demo patients I have accessed only one training material. I would need check more training materials to be able to answer this question.

To be able to answer this question, I should be able to see all the training material that I have been assigned. And this has not been the case.

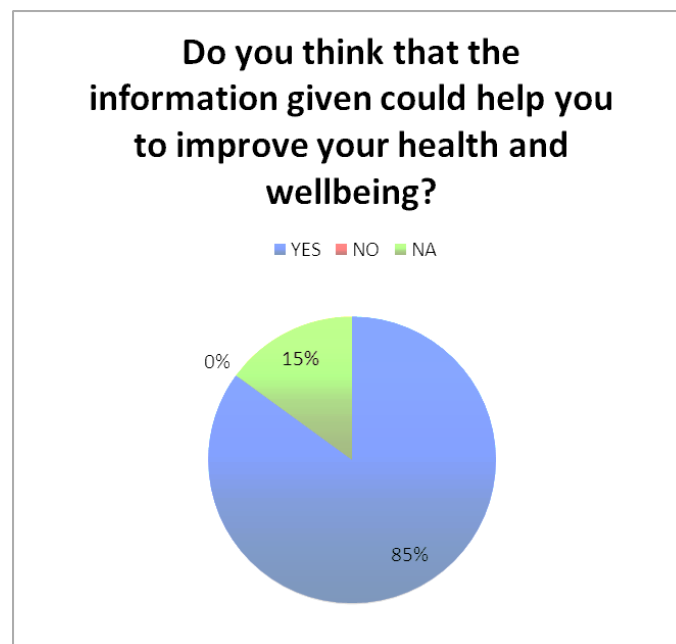


Figure 7: Do you think that the information given could help you to improve your health and wellbeing?

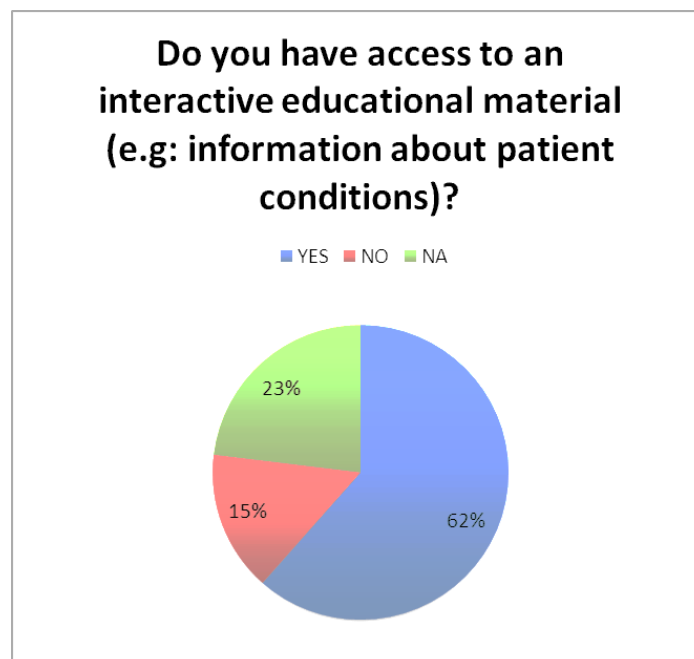


Figure 8: Do you have access to interactive educational material (e.g.: information about patient conditions)?

Table 4 : Do you have access to interactive educational material (e.g.: information about patient conditions)?

None available
I guess that I could have access but I have not been able to prove it with the demo patient.
I have not seen it
I have not tried it enough

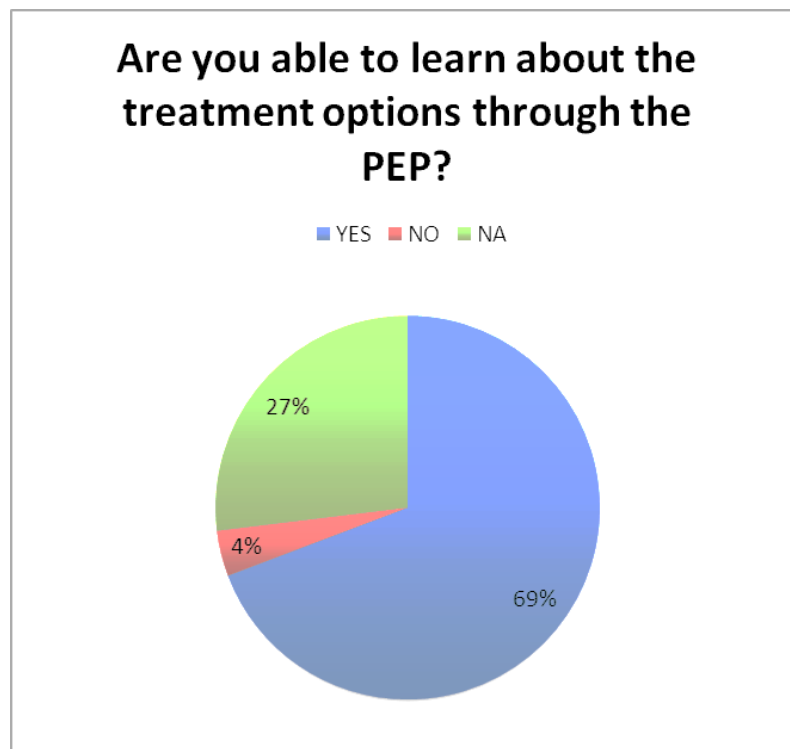


Figure 9: Are you able to learn about treatment options through the PEP?

Table 5: Are you able to learn about treatment options through the PEP?

Depends on which materials are presented
--

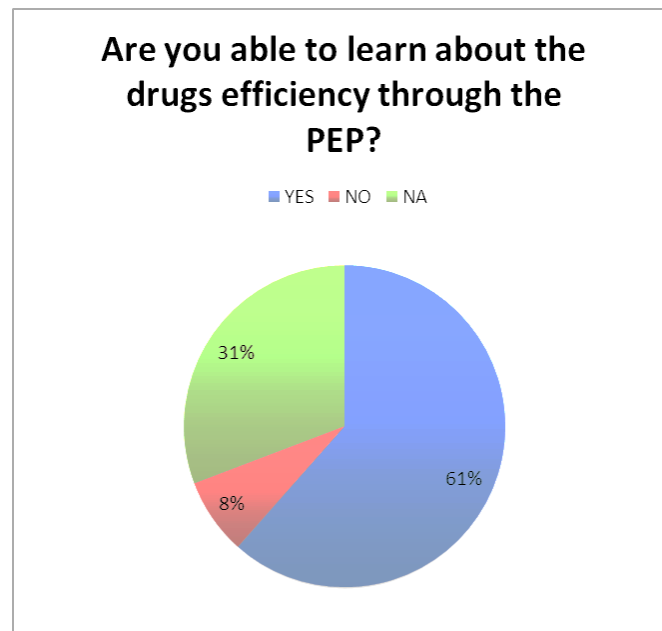


Figure 10: Are you able to learn about drugs efficiency through the PEP?

Table 6: Are you able to learn about drugs efficiency through the PEP?

Depends on which materials are presented
I do not know, here I have not stopped

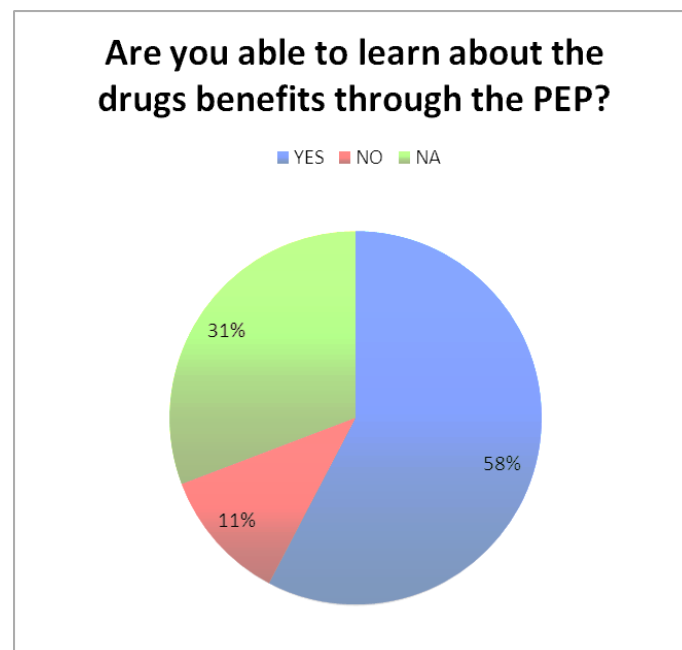


Figure 11: Are you able to learn about drug benefits through the PEP?

Table 7: Are you able to learn about drug benefits through the PEP?

Not recorded
Depends on which materials are presented
I have not stopped

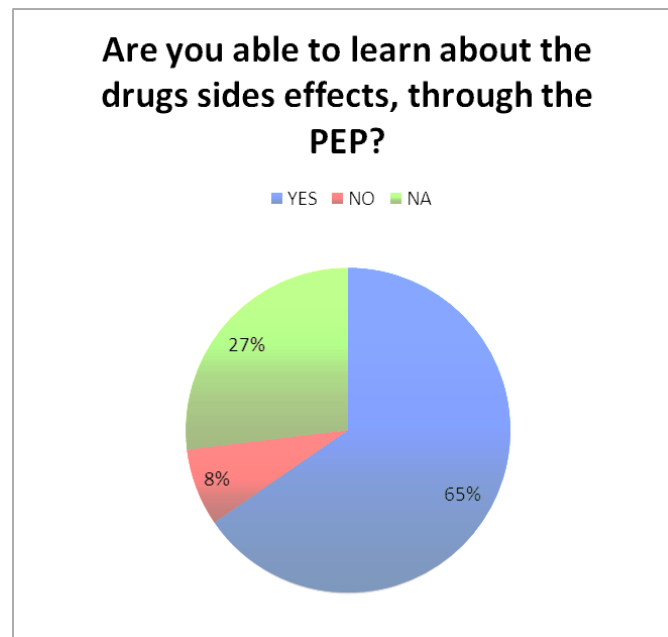


Figure 12: Are you able to learn about drugs side effects, through the PEP?

Table 8: Are you able to learn about drugs side effects, through the PEP?

Not recorded
Depends on which materials are presented

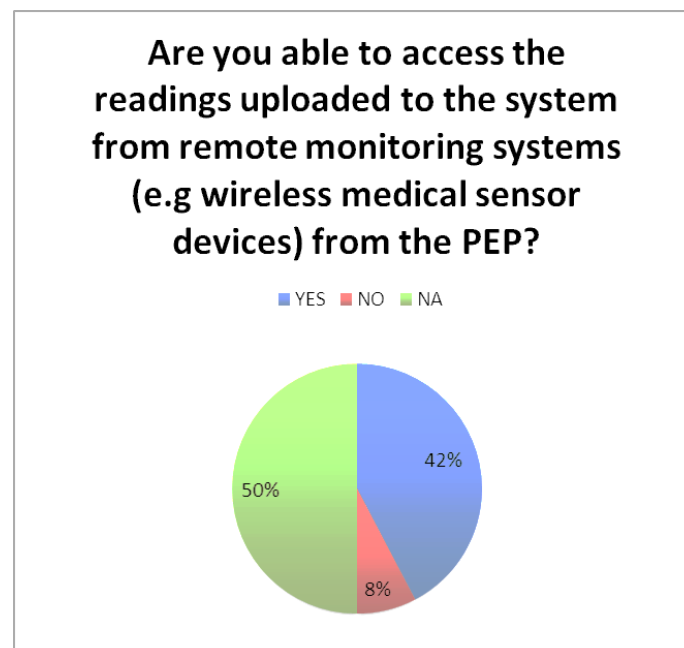


Figure 13: Are you able to access the readings uploaded to the system from remote monitoring systems (e.g. wireless medical sensor devices) from the PEP?

Table 9: Are you able to access the readings uploaded to the system from remote monitoring systems (e.g. wireless medical sensor devices) from the PEP?

Not available
I have not tried it

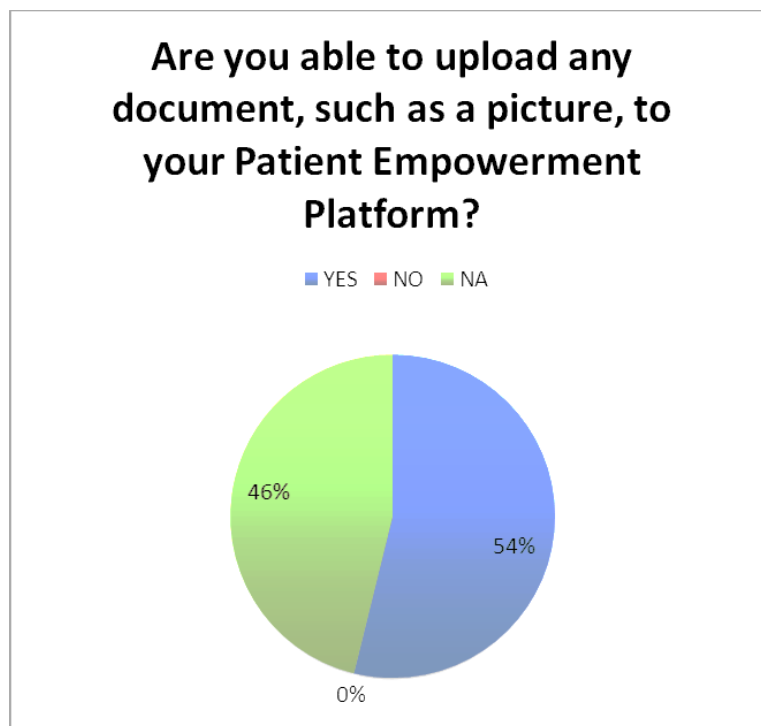


Figure 14: Are you able to upload documents, such as a picture, to your Patient Empowerment Platform?

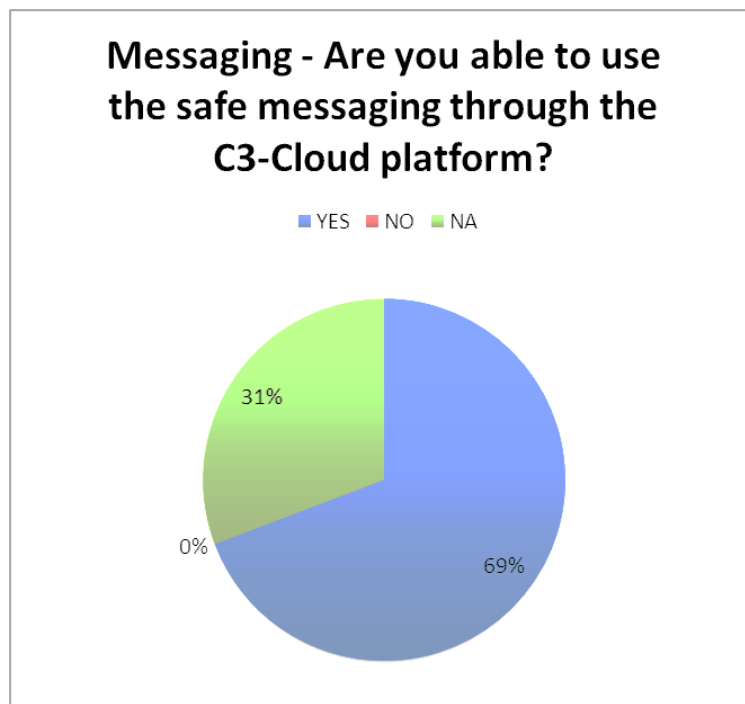


Figure 15: Messaging - Are you able to use the safe messaging through the C3-Cloud platform?

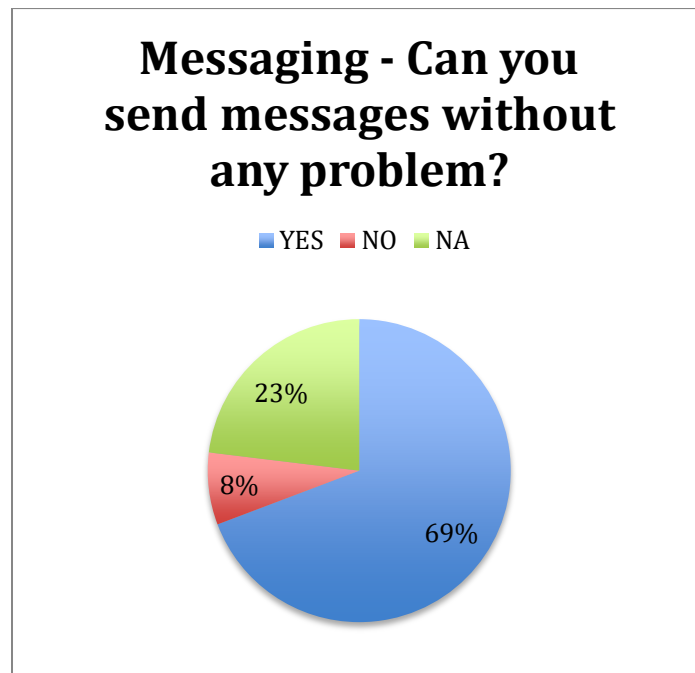


Figure 16: Messaging - Can you send messages without any problem?

Table 10: Messaging - Can you send messages without any problem?

The functionality is there and it is solved from the healthcare professional to me. However, some temporary problems have made me impossible to test this functionality.

Due to unforeseen problems I have not been able but the system allow it easily.



Figure 17: Messaging - Can you receive messages without any problem?

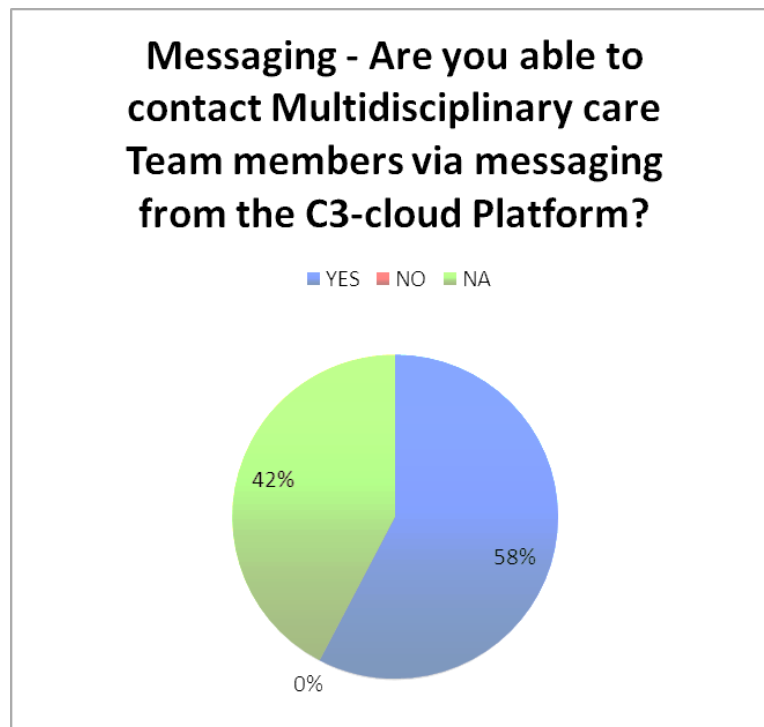


Figure 18: Messaging - Are you able to contact Multidisciplinary care Team members via messaging from the C3-cloud Platform?



Figure 19: Video calls - Are you able to join a video conferencing session with Multidisciplinary care Team members?



Figure 20: Video calls - Are you able to see Multidisciplinary care Team members through the video conferencing?



Figure 21: Video calls - Are you able to hear Multidisciplinary care Team members through the video conferencing?

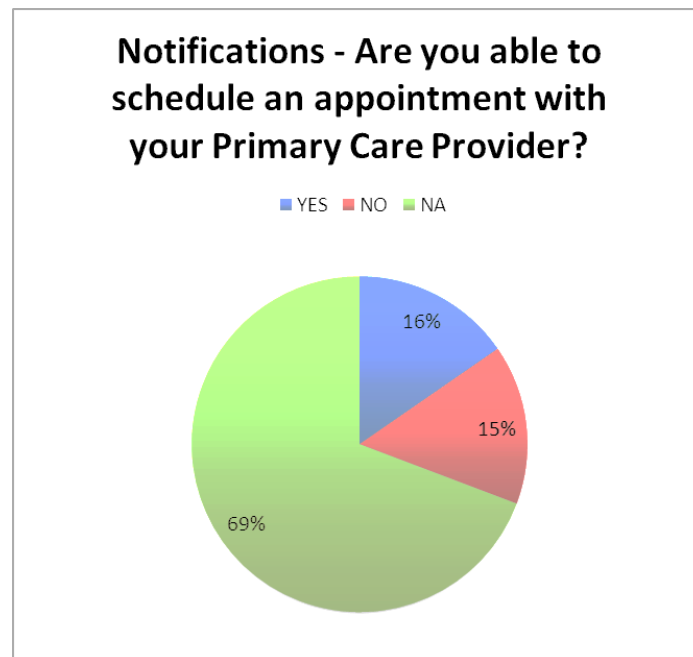


Figure 22: Notifications - Are you able to schedule an appointment with your Primary Care Provider?

Table 11: Notifications - Are you able to schedule an appointment with your Primary Care Provider?

I can not find the option to schedule a appointment
i was not able to click on appointment option
I was not able to click on appointment
Not possible in Osakidetza

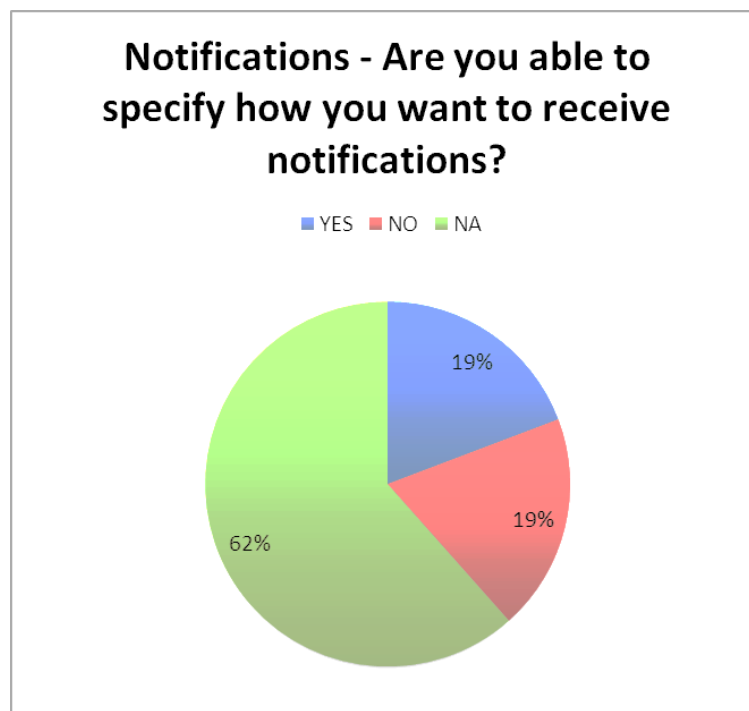
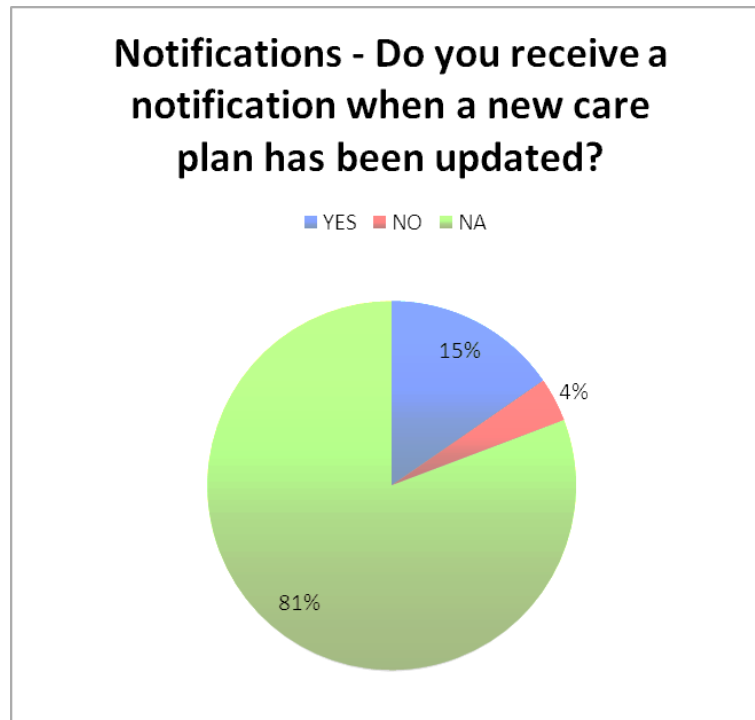


Figure 23: Notifications - Are you able to specify how you want to receive notifications?

Table 12: Notifications - Are you able to specify how you want to receive notifications?

I can not find the option to specify it
I was not able to find the option to specify how to receive notifications
I couldn't find that option
I have not found that possibility in the platform.
I have not been informed about it

**Figure 24: Notifications - Do you receive a notification when a new care plan has been updated?****Table 13: Notifications - Do you receive a notification when a new care plan has been updated?**

I have not been able to see it.

Conclusion

Mainly the application testing was performed without any incident. The online platform worked well. These Figures and Tables reflect row results from patients and informal care givers.

Referring to received comments, we can say that most of NO responses to Application testing questionnaire are due to “not finding the option”, “not knowing”, “not been informed about it”, “Not clear how to work through the system”, “Not obvious what needs to be done”, “More time needed”. Also, there were feedbacks that were vague to interpret, for example “Depends on which materials are presented”, “I have not stopped”. Participants need to be more specific about the problem they faced.

Functionalities related to communication and notifications were generally NA answered. One another hand, since there was a single version of the questionnaire for all pilot sites, there

were questions which were not relevant in some case i.e.: “Notifications - Are you able to schedule an appointment with your Primary Care Provider?” Such functionality is not expected in Osakidetza. In the upcoming WP9 tasks, further analysis of the results can be performed.

Overall, this testing is an interim testing to adapt the system where needed and to get first insight for further development. Integrating the questions into the walkthrough document so that participants can answer the questions as they are testing the relevant sections would make it simpler for the participants.

10.5 Appendix 5 QUIS7 Usability Testing [M25]

QUIS7 Usability Testing [M25] Questionnaire

Dear participant,

Your feedback is very valuable to us and we appreciate your participation in this demonstration session.

In the following 10 minutes we kindly ask you fill in the “QUIS”-questionnaire.

The QUIS (Questionnaire for User Interaction Satisfaction) is a tool to assess your personal satisfaction with how the C3-Cloud software is presented to you.

The questionnaire asks for your feedback on your overall satisfaction with the C3-Cloud software. It does that along several topics, including: your overall reaction to the software; the screen; the terminology used; learning factors, the capabilities of the software and how you experienced them, the user manuals that you saw.

You can save your progress anytime during the survey and resume it later by clicking the button on the upper right hand corner of the page and then by following the process. Thank you very much in advance.

There are 74 questions in this survey.

Overall Reaction to the C3-Cloud System

Please **select** the number per question, which most appropriately reflects your impression about using the C3-Cloud software.

If you prefer not to answer a question, you can leave it unanswered.

I find the C3-Cloud system:

Please choose the appropriate response for each item:

Terrible ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Wonderful

I find the C3-Cloud system:

Please choose the appropriate response for each item:

Frustrating ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Satisfying

I find the C3-Cloud system:

Please choose the appropriate response for each item:

Dull ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Stimulating

I find the C3-Cloud system:

Please choose the appropriate response for each item:

Difficult ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Easy

I find the C3-Cloud system having:

Please choose the appropriate response for each item:

Inadequate power ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Adequate power

I find the C3-Cloud system:

Please choose the appropriate response for each item:

Rigid ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Flexible

The ScreenPlease **select** the number per question, which most appropriately reflects your impression about using the C3-Cloud software.

If you prefer not to answer a question, you can leave it unanswered.

Characters on the computer screen are:

Please choose the appropriate response for each item:

Hard to read ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Easy to read

The image of characters are:

Please choose the appropriate response for each item:

Fuzzy 0 1 2 3 4 5 6 7 8 9 Sharp

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The highlighting on the screen is:

Please choose the appropriate response for each item:

Unhelpful 0 1 2 3 4 5 6 7 8 9 Very helpful

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The use of bolding is:

Please choose the appropriate response for each item:

Unhelpful 0 1 2 3 4 5 6 7 8 9 Very helpful

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The screen layouts were helpful:

Please choose the appropriate response for each item:

Never 0 1 2 3 4 5 6 7 8 9 Always

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The amount of information that can be displayed on the screen is:

Please choose the appropriate response for each item:

Inadequate 0 1 2 3 4 5 6 7 8 9 Adequate

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The arrangement of information on screen is:

Please choose the appropriate response for each item:

Illogical 0 1 2 3 4 5 6 7 8 9 Logical

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The sequence of screens is:

Please choose the appropriate response for each item:

Confusing 0 1 2 3 4 5 6 7 8 9 Clear

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The next screen in a sequence is:

Please choose the appropriate response for each item:

Unpredictable 0 1 2 3 4 5 6 7 8 9 Predictable

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Going back to the previous screen is:

Please choose the appropriate response for each item:

Impossible 0 1 2 3 4 5 6 7 8 9 Easy

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Progression of work-related tasks is:

Please choose the appropriate response for each item:

Confusing 0 1 2 3 4 5 6 7 8 9 Clearly marked

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Terminology and System InformationPlease **select** the number per question, which most appropriately reflects your impression about using the C3-Cloud software.

If you prefer not to answer a question, you can leave it unanswered.

The use of terminology throughout system is:

Please choose the appropriate response for each item:

Inconsistent 0 1 2 3 4 5 6 7 8 9 Consistent

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The work related terminology is:

Please choose the appropriate response for each item:

Inconsistent 0 1 2 3 4 5 6 7 8 9 Consistent

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The computer terminology is:

Please choose the appropriate response for each item:

Inconsistent 0 1 2 3 4 5 6 7 8 9 Consistent

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The terminology relates well to the activities I am doing:

Please choose the appropriate response for each item:

Never 0 1 2 3 4 5 6 7 8 9 Always

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Computer terminology is used:

Please choose the appropriate response for each item:

Too frequently 0 1 2 3 4 5 6 7 8 9 Appropriately

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Terminology on the screen is:

Please choose the appropriate response for each item:

Ambiguous 0 1 2 3 4 5 6 7 8 9 Precise

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Messages that appear on the screen are:

Please choose the appropriate response for each item:

Inconsistent 0 1 2 3 4 5 6 7 8 9 Consistent

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The position of instructions on the screen is:

Please choose the appropriate response for each item:

Inconsistent 0 1 2 3 4 5 6 7 8 9 Consistent

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Messages that appear on the screen are:

Please choose the appropriate response for each item:

Confusing 0 1 2 3 4 5 6 7 8 9 Clear

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Instructions for commands or functions are:

Please choose the appropriate response for each item:

Confusing ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Clear

Instructions for correcting errors are:

Please choose the appropriate response for each item:

Confusing ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Clear

The computer keeps me informed about what it is doing:

Please choose the appropriate response for each item:

Never ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Always

Animated cursors keep me informed:

Please choose the appropriate response for each item:

Never ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Always

Performing an operation leads to a predictable result:

Please choose the appropriate response for each item:

Never ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Always

Controlling the amount of feedback is:

Please choose the appropriate response for each item:

Impossible ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Easy

The length of delay between operations is:

Please choose the appropriate response for each item:

Unacceptable ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Acceptable

Error messages are:

Please choose the appropriate response for each item:

Unhelpful 0 1 2 3 4 5 6 7 8 9 Helpful

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Error messages clarify the problem:

Please choose the appropriate response for each item:

Never 0 1 2 3 4 5 6 7 8 9 Always

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Phrasing of error messages are:

Please choose the appropriate response for each item:

Unpleasant 0 1 2 3 4 5 6 7 8 9 Pleasant

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Learning

Please **select** the number per question, which most appropriately reflects your impression about using the C3-Cloud software.

If you prefer not to answer a question, you can leave it unanswered.

Learning to operate the system is:

Please choose the appropriate response for each item:

Difficult 0 1 2 3 4 5 6 7 8 9 Easy

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Getting started is:

Please choose the appropriate response for each item:

Difficult 0 1 2 3 4 5 6 7 8 9 Easy

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Time to learn to use the system is:

Please choose the appropriate response for each item:

Slow ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Fast

Exploration of features by trial and error is:

Please choose the appropriate response for each item:

Discouraging ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Encouraging

Number of steps per task are:

Please choose the appropriate response for each item:

Too many ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Just right

Feedback on the completion of a sequence of steps is:

Please choose the appropriate response for each item:

Unclear ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 Clear

Multimedia

Please **select** the number per question, which most appropriately reflects your impression about using the C3-Cloud software.

If you prefer not to answer a question, you can leave it unanswered.

Quality of still pictures/photographs was:

Please choose the appropriate response for each item:

Bad 0 1 2 3 4 5 6 7 8 9 Good

Pictures/Photos were:

Please choose the appropriate response for each item:

Fuzzy 0 1 2 3 4 5 6 7 8 9 Clear

Picture/Photo brightness was:

Please choose the appropriate response for each item:

Dim 0 1 2 3 4 5 6 7 8 9 Bright

Quality of movies was:

Please choose the appropriate response for each item:

Bad 0 1 2 3 4 5 6 7 8 9 Good

Brightness of movie images was:

Please choose the appropriate response for each item:

Dim 0 1 2 3 4 5 6 7 8 9 Bright

Movie window size is adequate:

Please choose the appropriate response for each item:

Never 0 1 2 3 4 5 6 7 8 9 Always

Sound output was:

Please choose the appropriate response for each item:

Inaudible 0 1 2 3 4 5 6 7 8 9 Audible
 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Sound output was:

Please choose the appropriate response for each item:

Choppy 0 1 2 3 4 5 6 7 8 9 Smooth
 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Colours used are:

Please choose the appropriate response for each item:

Unnatural 0 1 2 3 4 5 6 7 8 9 Natural
 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Amount of colours available is:

Please choose the appropriate response for each item:

Inadequate 0 1 2 3 4 5 6 7 8 9 Adequate
 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Tutorials

Please **select** the number per question, which most appropriately reflects your impression about using the C3-Cloud software.

If you prefer not to answer a question, you can leave it unanswered.

The training workshop was:

Please choose the appropriate response for each item:

0 1 2 3 4 5 6 7 8 9

Useless 0 1 2 3 4 5 6 7 8 9 Helpful
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

User Manuals

Please **select** the number per question, which most appropriately reflects your impression about using the C3-Cloud software.

If you prefer not to answer a question, you can leave it unanswered.

The terminology used in the manuals is:

Please choose the appropriate response for each item:

Confusing 0 1 2 3 4 5 6 7 8 9 Clear
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The information from the manual is easily understood:

Please choose the appropriate response for each item:

Never 0 1 2 3 4 5 6 7 8 9 Always
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Finding a solution to a problem using the manual is:

Please choose the appropriate response for each item:

Impossible 0 1 2 3 4 5 6 7 8 9 Easy
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Amount of help given is:

Please choose the appropriate response for each item:

Inadequate 0 1 2 3 4 5 6 7 8 9 Adequate
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Placement of help messages on the screen is:

Please choose the appropriate response for each item:

Confusing 0 1 2 3 4 5 6 7 8 9 Clear

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Accessing help messages is:

Please choose the appropriate response for each item:

Difficult 0 1 2 3 4 5 6 7 8 9 Easy

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

System Capabilities

Please **select** the number per question, which most appropriately reflects your impression about using the C3-Cloud software.

If you prefer not to answer a question, you can leave it unanswered.

System speed is:

Please choose the appropriate response for each item:

Too slow 0 1 2 3 4 5 6 7 8 9 Fast enough

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Response time for most operations is:

Please choose the appropriate response for each item:

Too slow 0 1 2 3 4 5 6 7 8 9 Fast enough

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The system is reliable:

Please choose the appropriate response for each item:

Never 0 1 2 3 4 5 6 7 8 9 Always

Operations are:

Please choose the appropriate response for each item:

Undependable 0 1 2 3 4 5 6 7 8 9 Dependable

System failures occur:

Please choose the appropriate response for each item:

Frequently 0 1 2 3 4 5 6 7 8 9 Seldom

The system warns me about potential problems:

Please choose the appropriate response for each item:

Never 0 1 2 3 4 5 6 7 8 9 Always

Correcting my mistakes is:

Please choose the appropriate response for each item:

Difficult 0 1 2 3 4 5 6 7 8 9 Easy

Correcting typos is:

Please choose the appropriate response for each item:

Complex 0 1 2 3 4 5 6 7 8 9 Simple

The ability to undo operations is:

Please choose the appropriate response for each item:

Inadequate 0 1 2 3 4 5 6 7 8 9 Adequate
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The ease of operation depends on my level of experience:

Please choose the appropriate response for each item:

Never 0 1 2 3 4 5 6 7 8 9 Always
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

I can accomplish tasks knowing only a few commands:

Please choose the appropriate response for each item:

With difficulty 0 1 2 3 4 5 6 7 8 9 Easily
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Software Installation

Please **select** the number per question, which most appropriately reflects your impression about using the C3-Cloud software.

If you prefer not to answer a question, you can leave it unanswered.

The speed of setting up (installing) the software was:

Please choose the appropriate response for each item:

Slow 0 1 2 3 4 5 6 7 8 9 Fast
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

I get informed of the installation progress:

Please choose the appropriate response for each item:

0 1 2 3 4 5 6 7 8 9

0

1

2

3

4

5

6

7

8

9

Never

☐

☐

☐

☐

☐

☐

☐

☐

☐

☐

Always

The installation gives meaningful explanation when failures occur:

Please choose the appropriate response for each item:

0

1

2

3

4

5

6

7

8

9

Never

☐

☐

☐

☐

☐

☐

☐

☐

☐

☐

Always

Do you have any additional comments?

Please write your answer here:

10.6 Appendix 6 QUIS7 Usability Testing Results [M25]

1. USABILITY OF C3DP

1.1. Category 1: Overall reaction to the C3-Cloud system

Test users were asked for their overall reactions to the C3DP along six different impressions. **Figure 11** shows the mean ratings of 20 users to the impressions on a scale from 0-9.

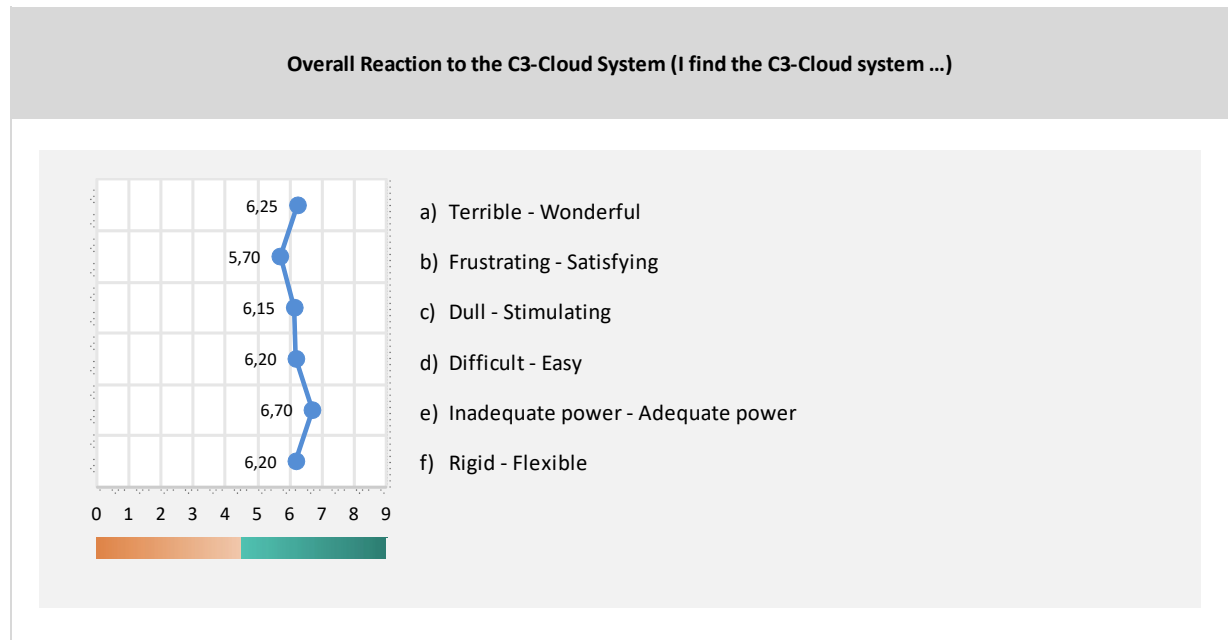


Figure 1: Overall Reaction to the C3-Cloud System (I find the C3-Cloud system ...)

When asked to rate the system from “terrible” to “wonderful” ((a) in **Figure 11** above), the C3DP is ranked an average of 6.25 with a standard deviation of 1.3 with a peak of 30% of users rating it a 5.

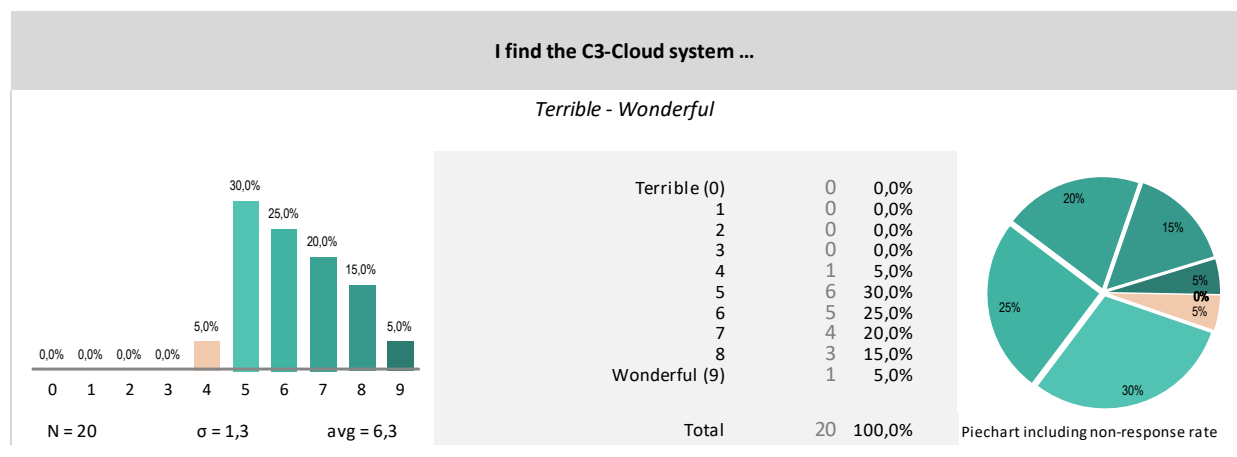


Figure 2: I find the C3-Cloud System (terrible – wonderful)

The results are not as clear in terms of if respondents are frustrated or satisfied with the system. With an average of 5.70 with a standard deviation of 1.9, there would be room for further discussion of why some users found C3DP frustrating (b).

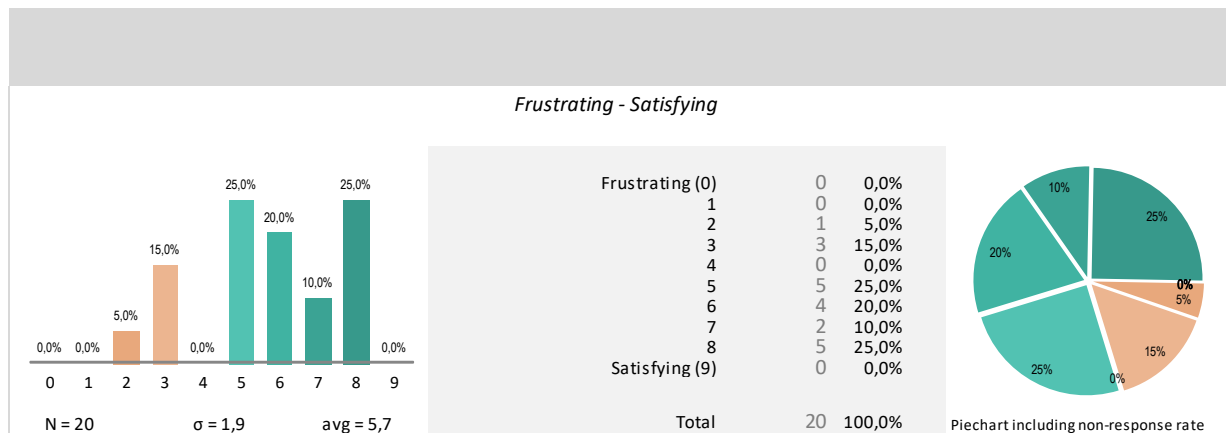


Figure 3: I find the C3-Cloud System (frustrating – satisfying)

An average of 6.2 with a 1.8 standard deviation captures the users' impression on the system as being stimulating (c). However, users mostly preferred to rate the system somewhere on the middle of the 0-9 spectrum.

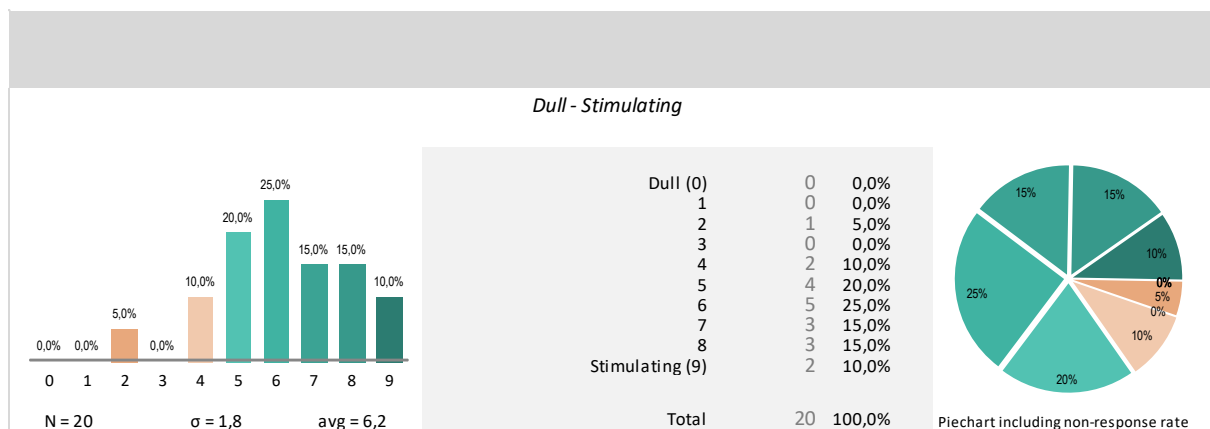


Figure 4: I find the C3-Cloud System (dull – stimulating)

A similar pattern is repeated for the users' impression of the system being "Difficult" or "Easy" (d). An average of 6.2 and a standard deviation of 1.9 indicate that the majority rates the C3DP being rather easy to use.

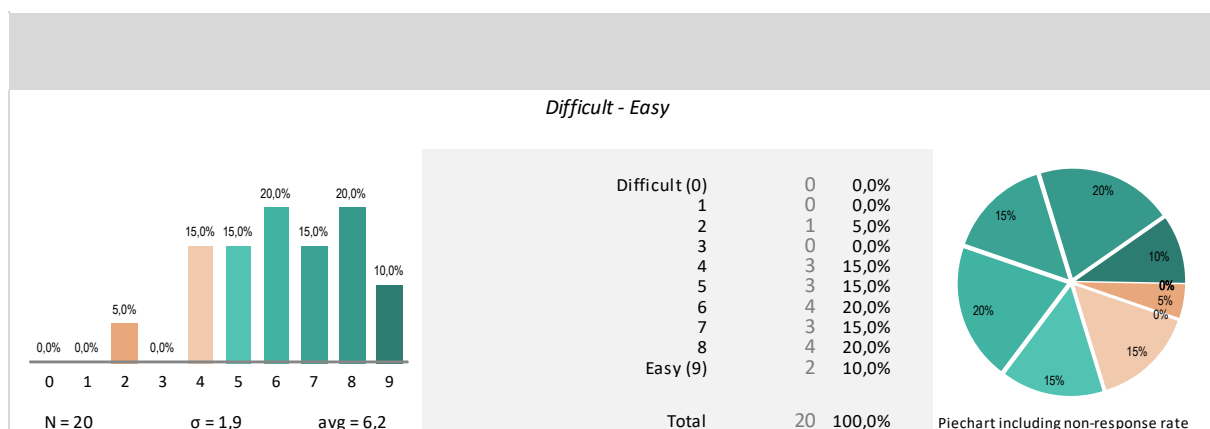


Figure 5: I find the C3-Cloud System (difficult – easy)

The 6.7 average on the next chart shows that the users also think that the system has adequate power in general. However, based on two outliers (rating only 1 and 3), the standard deviation increases to 2.1. This opens the floor for a discussion of why a few respondents had an impression that the system does not have adequate power (e), while the majority rates C3DP having adequate power.

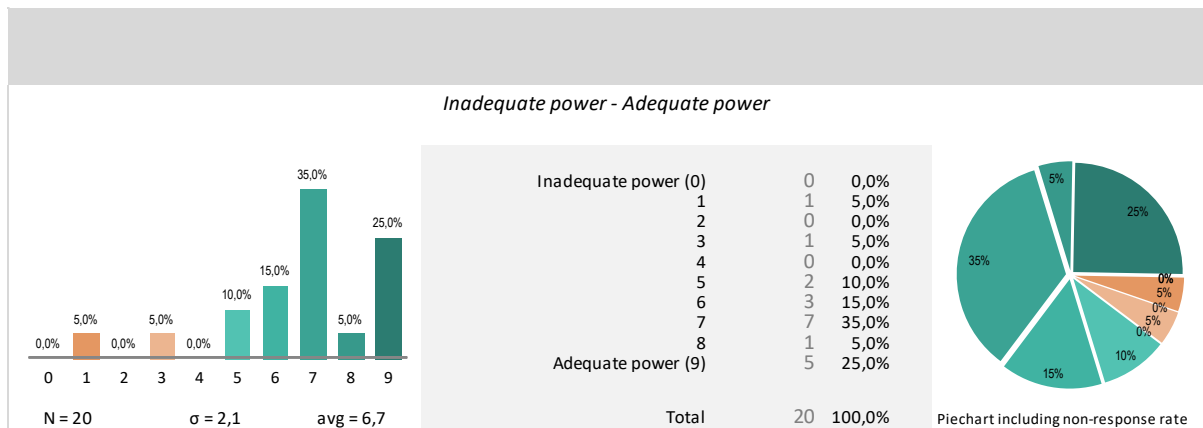


Figure 6: I find the C3-Cloud System having (having inadequate power – having adequate power)

Users rated the C3DP rather flexible than rigid (f). With an average of 6.2 (STD=1.2) users generally think that the system is flexible.

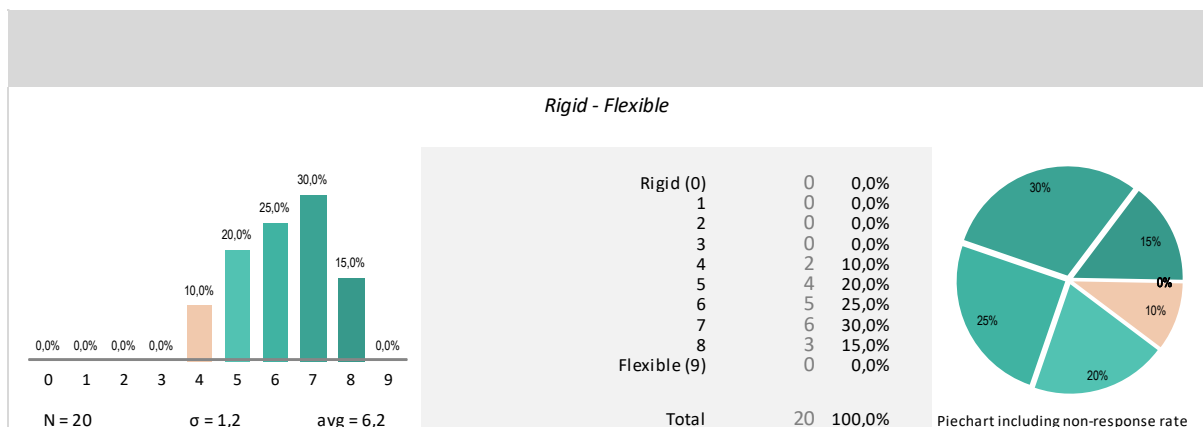


Figure 7: I find the C3-Cloud System (rigid – flexible)

1.2. Category 2: The screen

When asked to rate the system from “Hard to read”-“Easy to read” (a), the system is ranked an average of 6.9 with a standard deviation of 2.1. The users mostly tended to read the characters on the screen easily. However, some users seem to be of a different opinion by not rating it high. One user also rated the characters being hard to read.

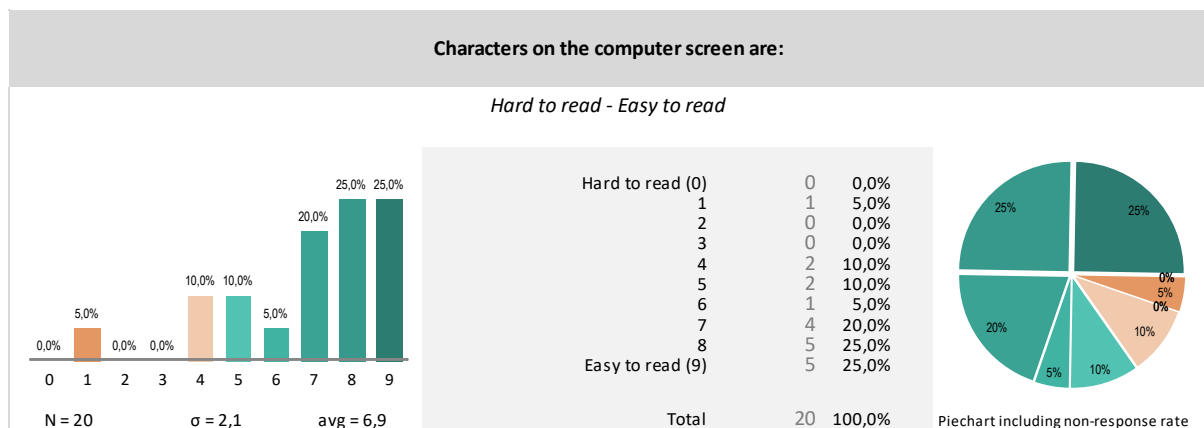


Figure 8: Characters on the computer screen are (hard to read – easy to read)

When asked to rate fuzziness and sharpness of the image of characters (b), the average is 7.9 (STD=1.1). With an exception of a few users' less positive rating, the overall rating is inclined towards 8 and 9.

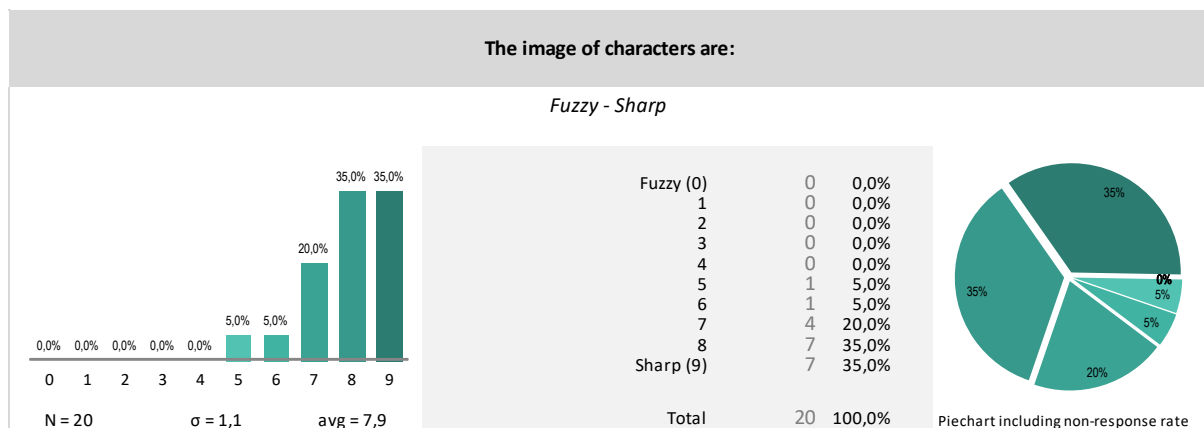


Figure 9: The image of characters are (fuzzy – sharp)

An average 6.9 with a standard deviation of 1.2 is the perception of screen highlighting (c). With almost half the users rating this indicator a 7, the rating slightly leans toward “very helpful”.

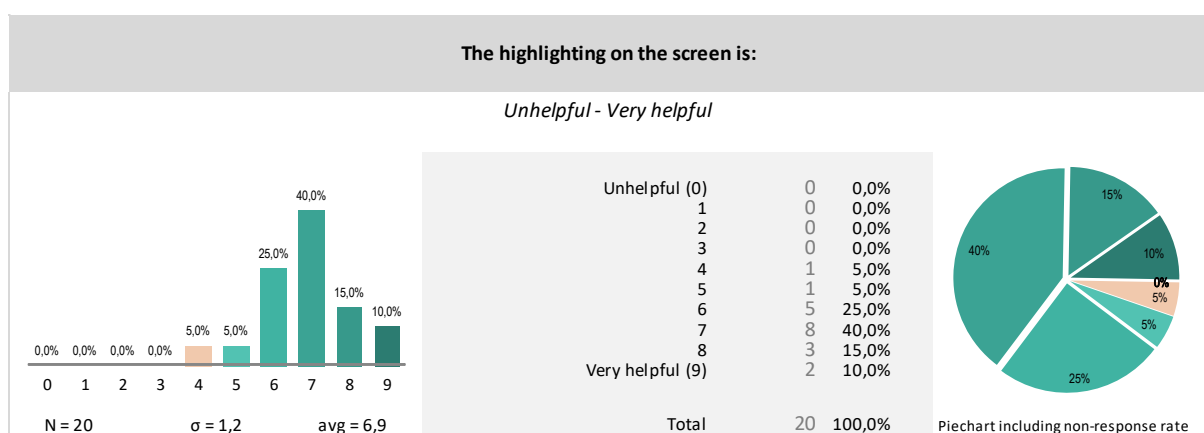


Figure 10: The highlighting on the screen is (unhelpful - very helpful)

When asked to rate the “Use of bolding” (d), the average is 6.2 (STD=1.8). Most of the users rated the use of bolding to be helpful; however, two users thought that the bolding was rather unhelpful.

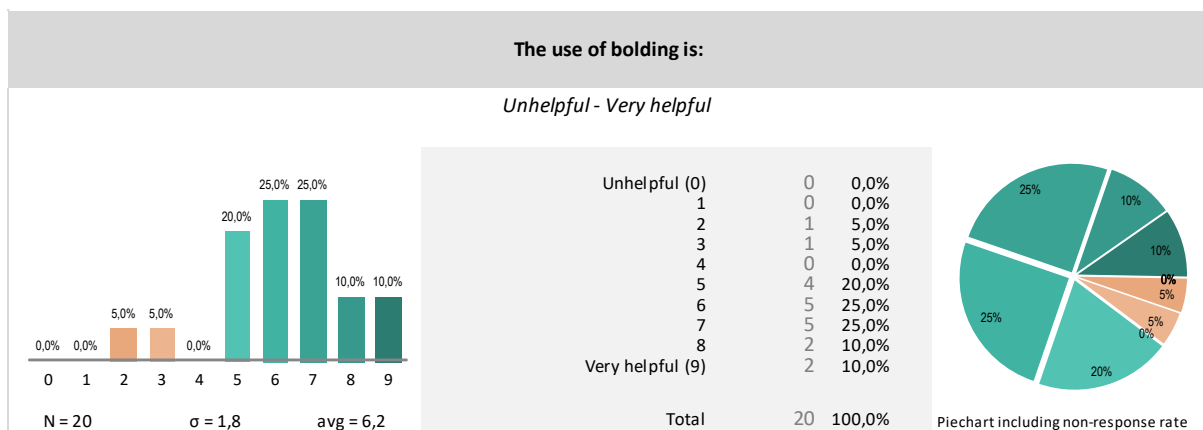


Figure 11: The use of bolding is (unhelpful - very helpful)

The users tended to rate the helpfulness of the screen layout (e) with a 6.3 average and a 1.7 standard deviation. Only one user rated this feature “always” helpful with the rest of the ratings range from 3-8.

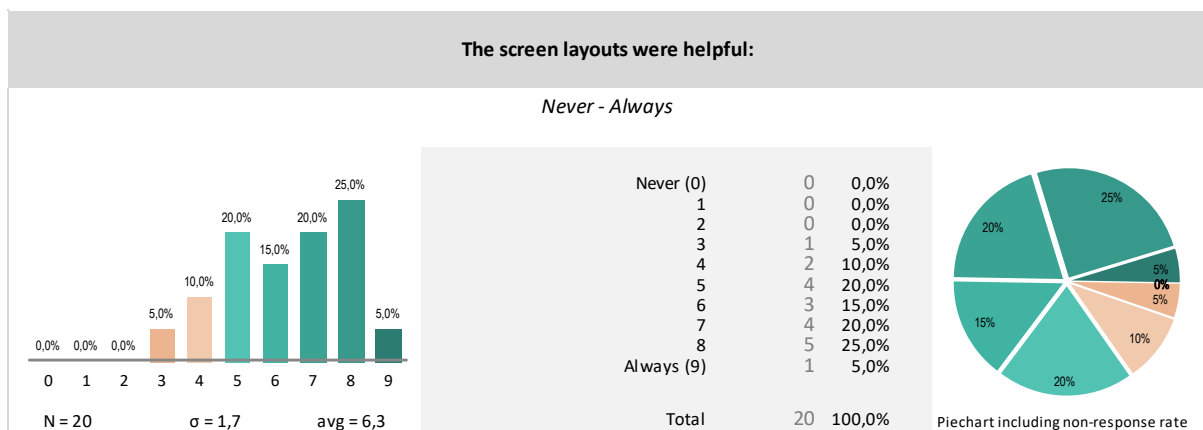


Figure 12: The screen layouts were helpful (never – always)

Test users rated the amount of information that can be displayed on the screen (f) with an average 6.7 (STD=1.6). The rating is skewed to the left “adequate” amount of information on the screen: However, one user believed that the amount of information on the screen was rather inadequate.

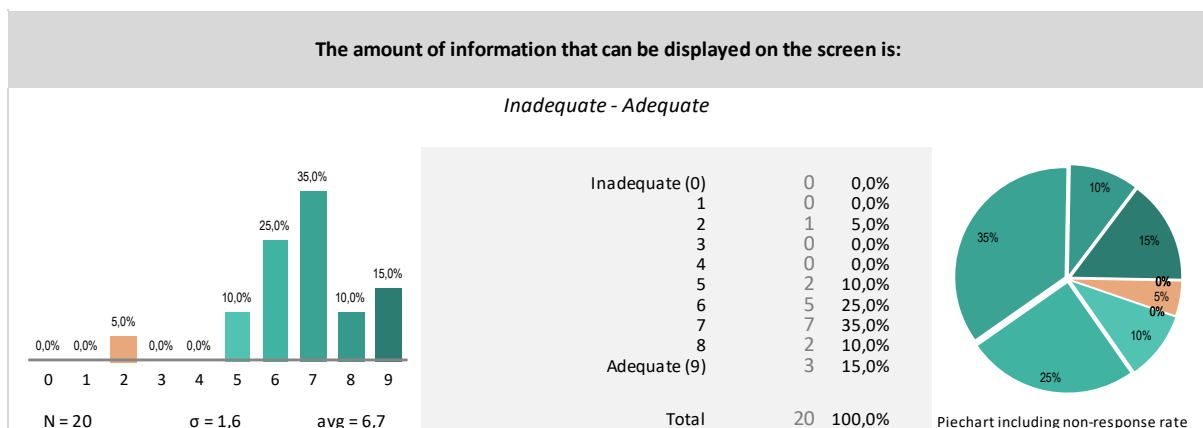


Figure 13: The amount of information that can be displayed on the screen is (inadequate – adequate)

The arrangement of information on the screen (g) is evaluated quite dispersed (range 1-9 with a $STD=2.2$). The average is 6.5 and although most users rate the arrangement of information to be “logical”, there are a quite a few users who rated this arrangement to be “illogical”.

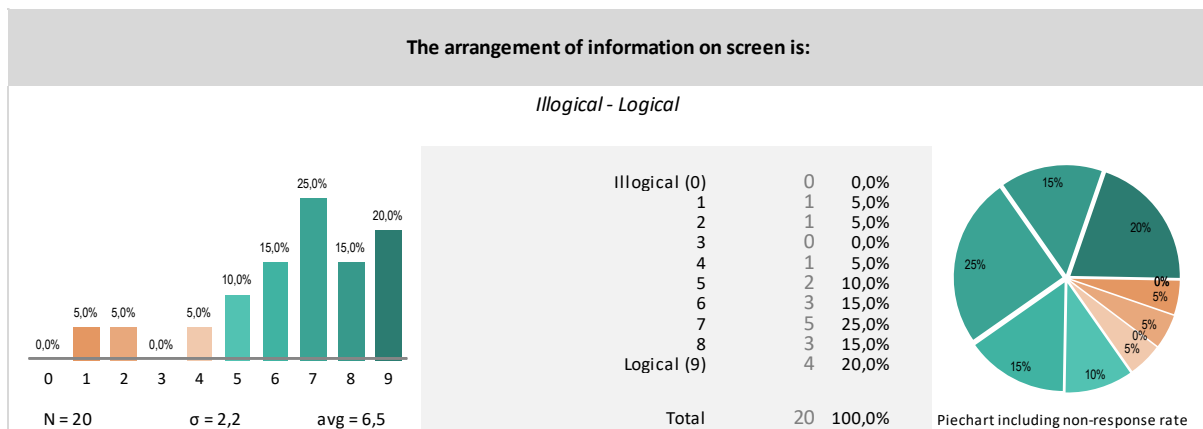


Figure 14: The arrangement of information on screen is (illogical – logical)

Quite similarly there is a standard deviation of 2.2 for the rating of the sequence of screens (h) with a mean of 6. The rating is inclined toward “clear”, but 4 users scored it in the range of 1-4, thinking that sequence of screens was rather “confusing”.

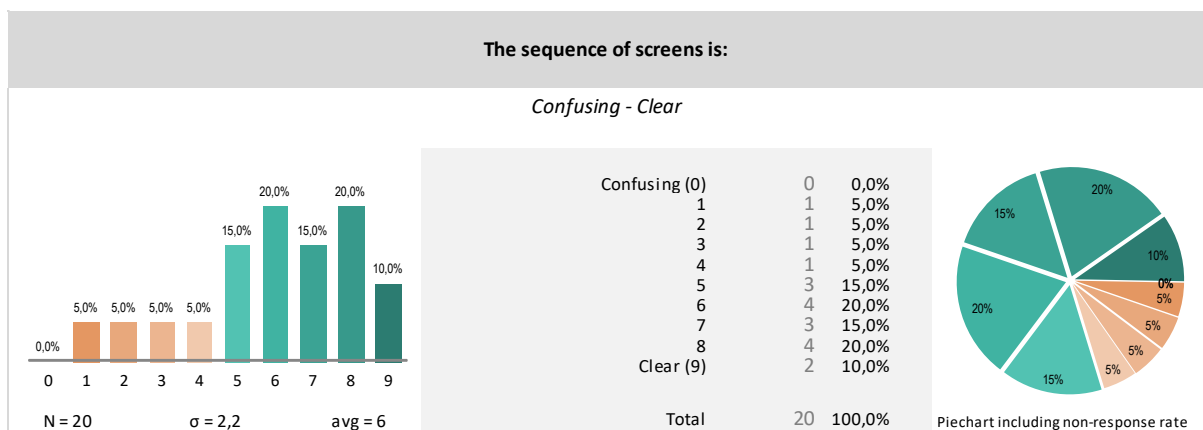


Figure 15: The sequence of screens is (confusing – clear)

Regarding the predictability and unpredictability of the next screen (i), the test users’ ratings mostly hovered between 6-8, with an average of 6.3 and a standard deviation of 1.9. Two users thought that the next screen in a sequence was rather unpredictable.

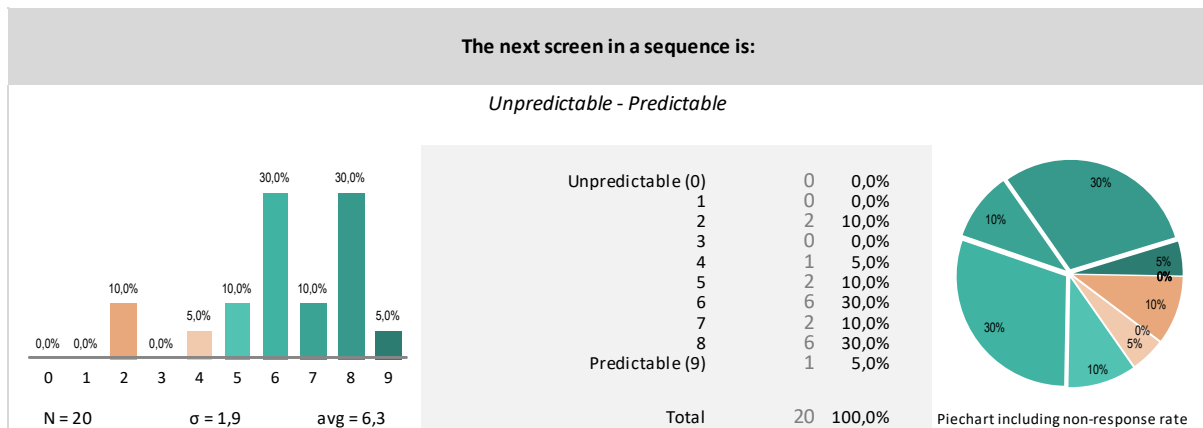


Figure 16: The next screen in a sequence is (unpredictable – predictable)

When asked to rate whether “going back to the previous screen” is “Easy” or “Impossible” (j), the average is 6.6 with a standard deviation of 2. 75% of responses rate 6 or higher with 25% of responses indicating a rather conservative evaluation (3 and 4).

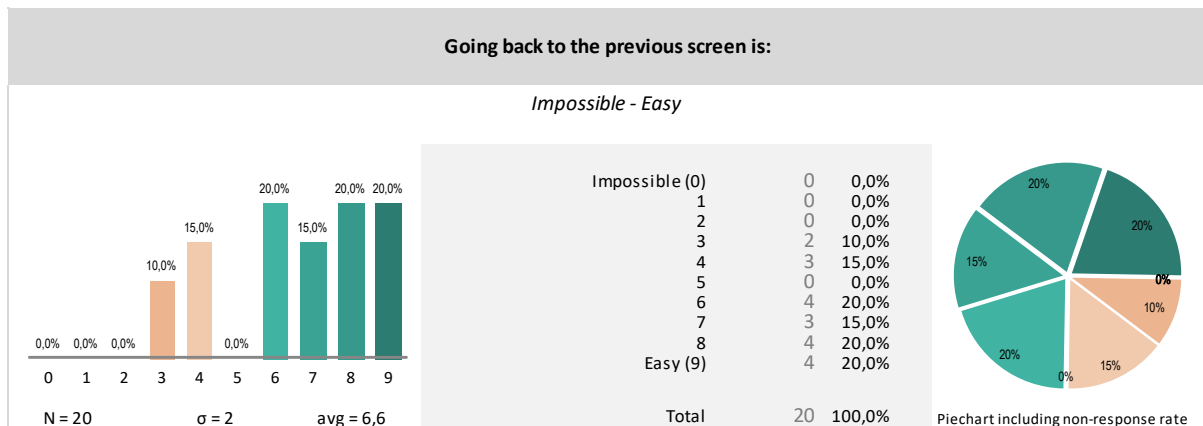


Figure 17: Going back to the previous screen is (impossible – easy)

The clarity in the progression of work-related tasks (k) was rated quite differently. An average of 5.8 and a standard deviation of 2.3 gives room for further investigations. Even more so since ratings range from 1-9.

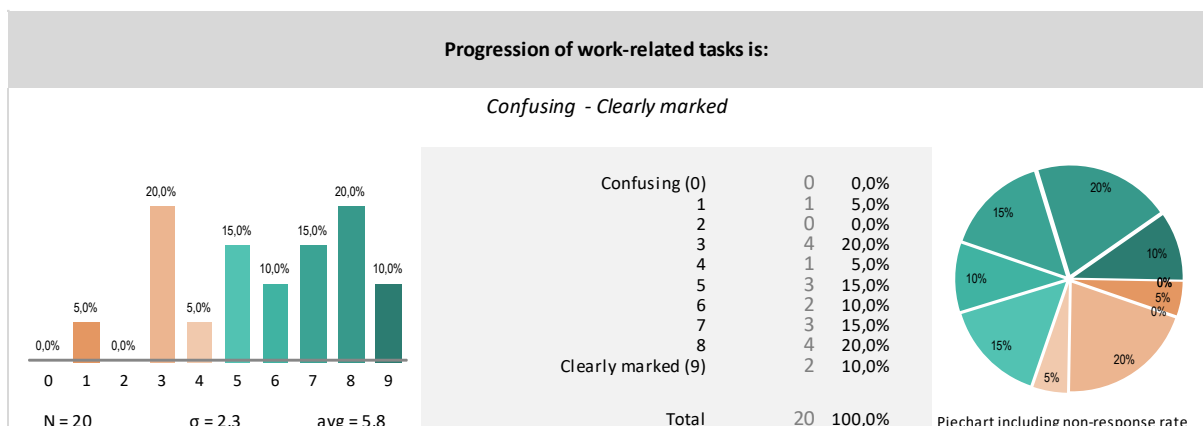


Figure 18: Progression of work-related tasks is (confusing – clearly marked)

1.3. Category 3: Terminology and system information

When asked to rate whether “The use of terminology throughout the system” is “Consistent” or “Inconsistent” (a), the average is 6.9 with a standard deviation of 1.5. 40% of users rated this feature a 6 which indicates that terminology can still be improved.

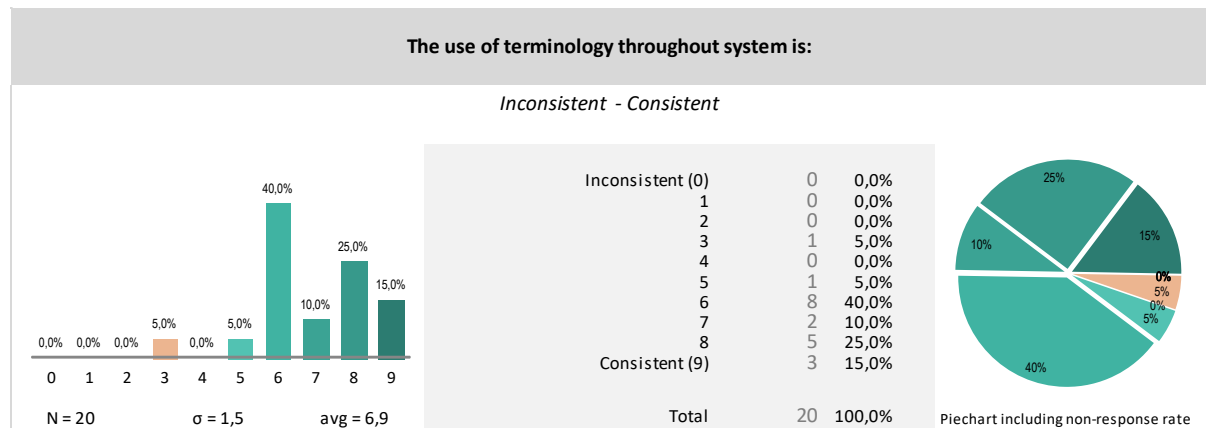


Figure 19: The use of terminology throughout system is (inconsistent – consistent)

Regarding the consistency and inconsistency of “The work related terminology” (b), the users ratings range from 3-9 with 55% rating it 7 or higher. The mean of 6.7 (STD=1.8) indicates that users rate work-related terminology rather consistent than inconsistent.

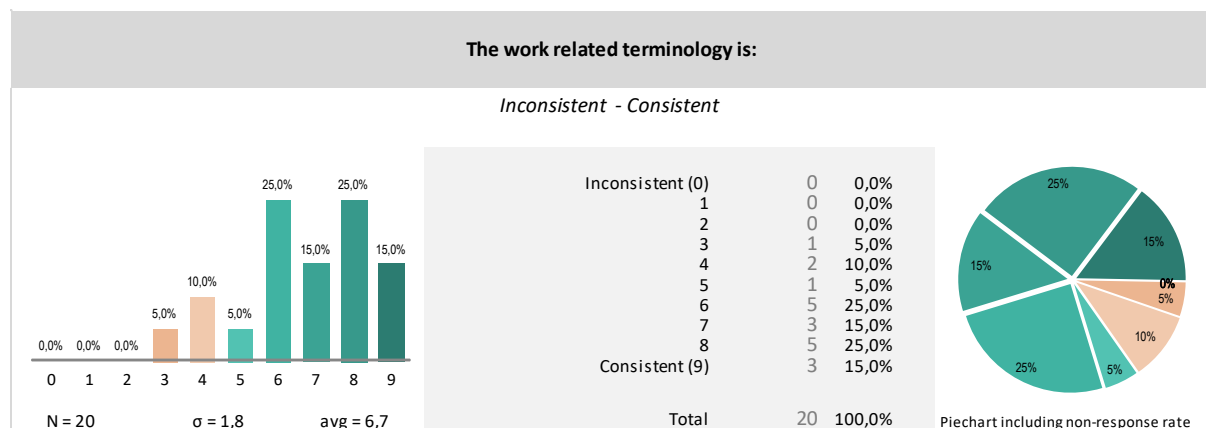


Figure 20: The work related terminology is (inconsistent – consistent)

Similarly to the above, test users rated the consistency and inconsistency of the “computer terminology” (c) with an average 6.6 and a standard deviation of 1.6. The ratings are inclined towards “consistent computer terminology” with 80% of users rating this feature a 6 or higher.

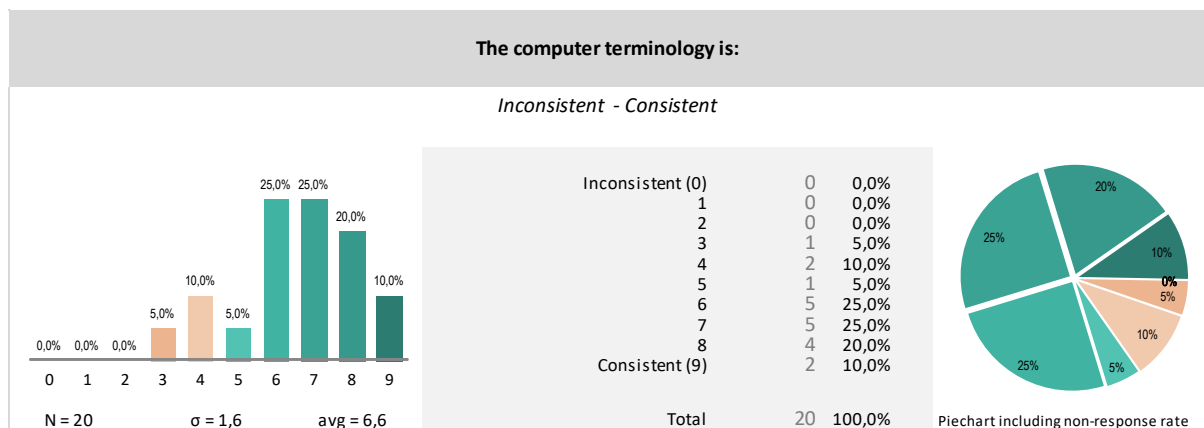


Figure 21: The computer terminology is (inconsistent – consistent)

The rating of whether “the terminology relates well to the activities of the user” (d) was perceived quite differently. Values range from 2-9 with a mean of 6.3 and a STD of 2. The ratings are right skewed and it could be further investigated why that is.

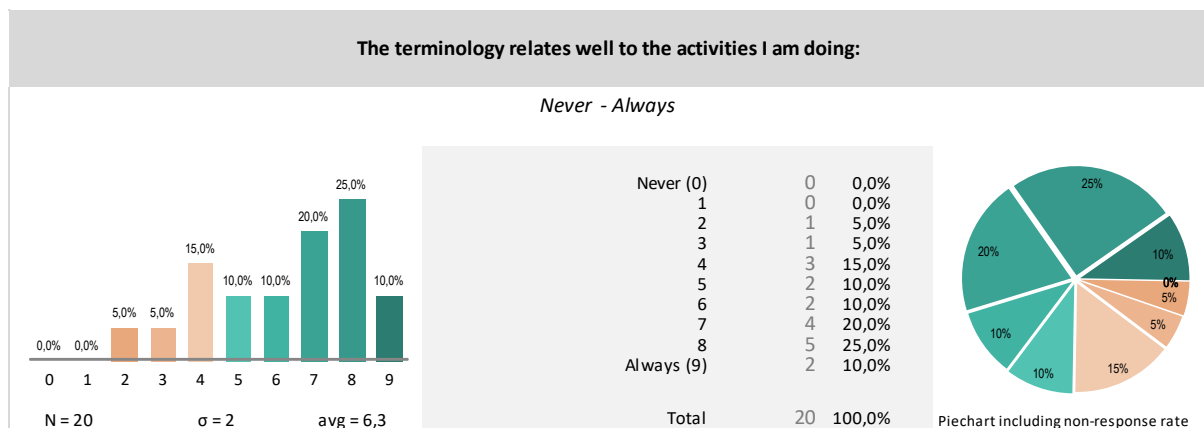


Figure 22: The terminology relates well to the activities I am doing (never – always)

When asked to rate if the frequency of computer terminology usage is appropriate or too frequent (e), the average is 7.9 with the standard deviation of 1.7 (5% non-response rate), indicating it being rather appropriate.

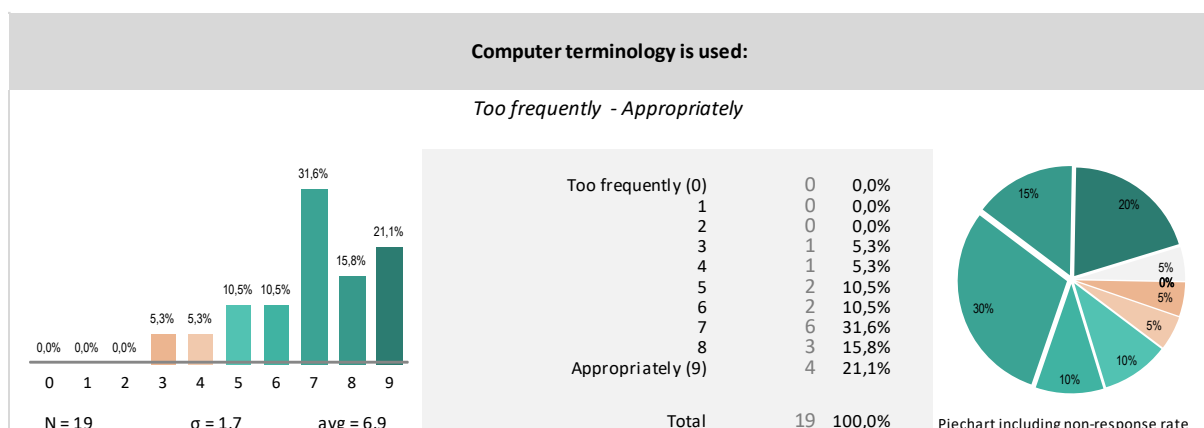


Figure 23: Computer terminology is used (too frequently – appropriately)

Test users rated whether the “Terminology on the screen is” “Ambiguous” or “Precise” (f) with a mean of 6.4 and a STD of 2 (5% non-response rate). 58% of users rated screen terminology being rather precise (7 and higher). However, the remaining 42% range from rating of 3-6, indicating that some users still find screen terminology a little ambiguous.

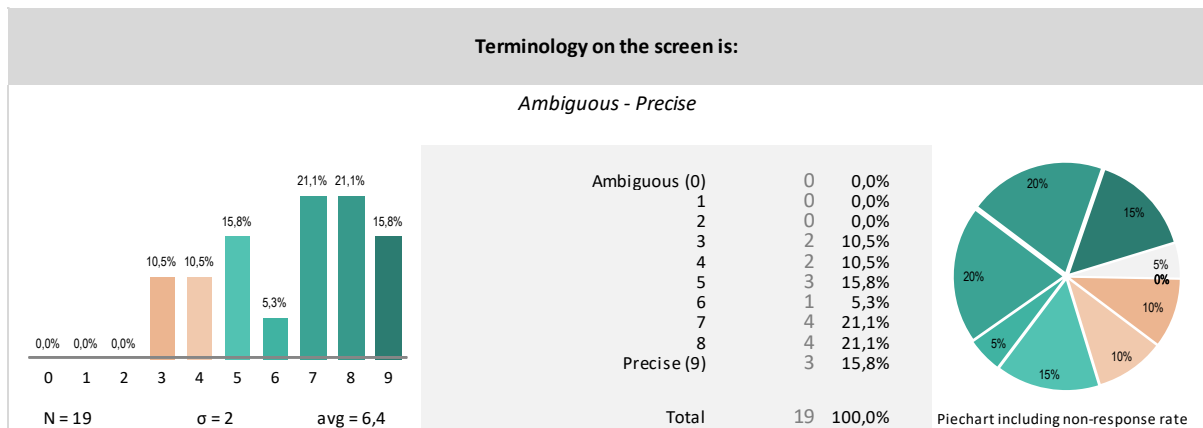


Figure 24: Terminology on the screen is (ambiguous – precise)

“Messages that appear on the screen” (g) are rated rather consistent than inconsistent, with a mean of 6.6. However, the STD of 2 indicated that the rating is rather heterogeneous, which is also reflected by the range of 3-9. Screen messages could thus be further investigated.

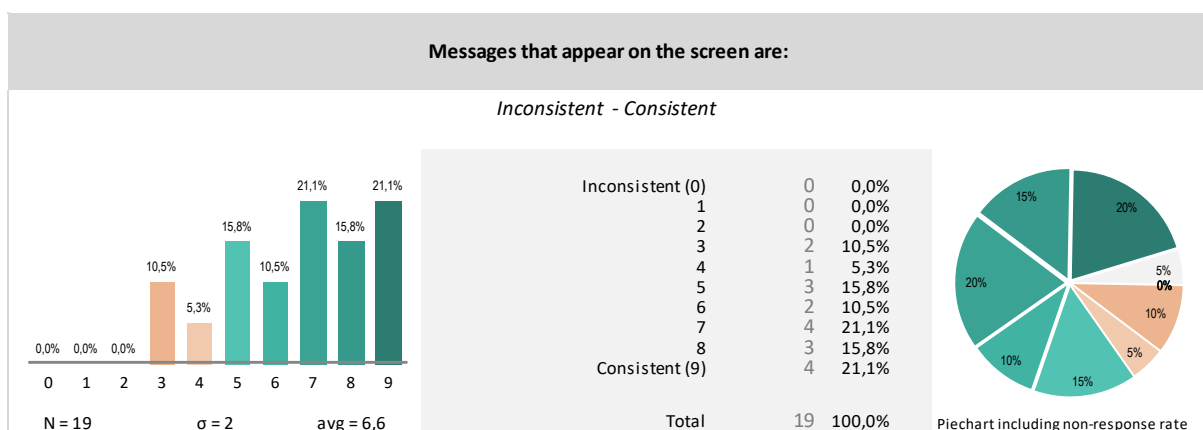


Figure 25: Messages that appear on the screen are (inconsistent – consistent)

When asked to rate the consistency of “the position of the instructions on the screen is” “Consistent” or “Inconsistent” (h), the average is 6.6 with a standard deviation of 2. Interestingly, two users rated this criterion only 2 or 3 and three users did not respond.

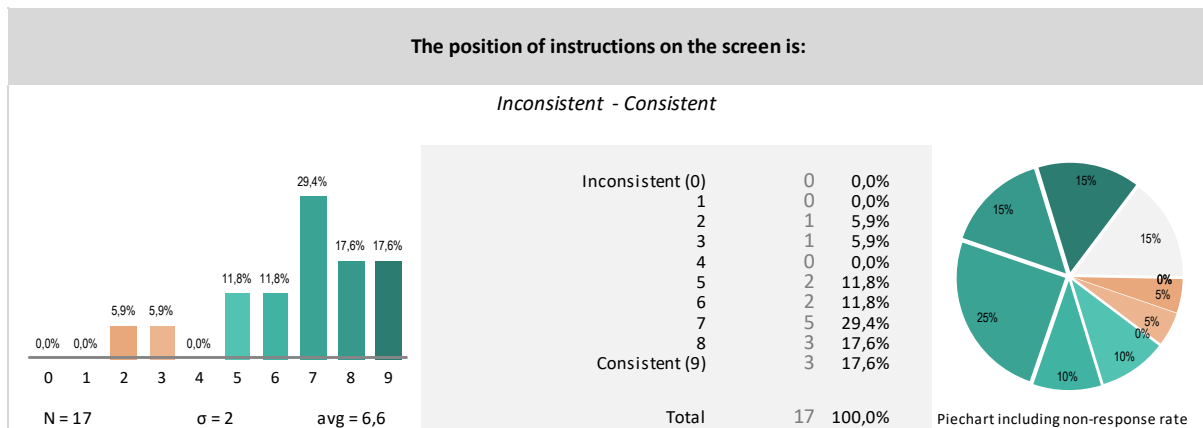


Figure 26: The position of instructions on the screen is (inconsistent – consistent)

“messages that appear on the screen” (i) were rated clear rather than unclear, with a mean of 6.8 (STD=1.9; 5% non response rate).

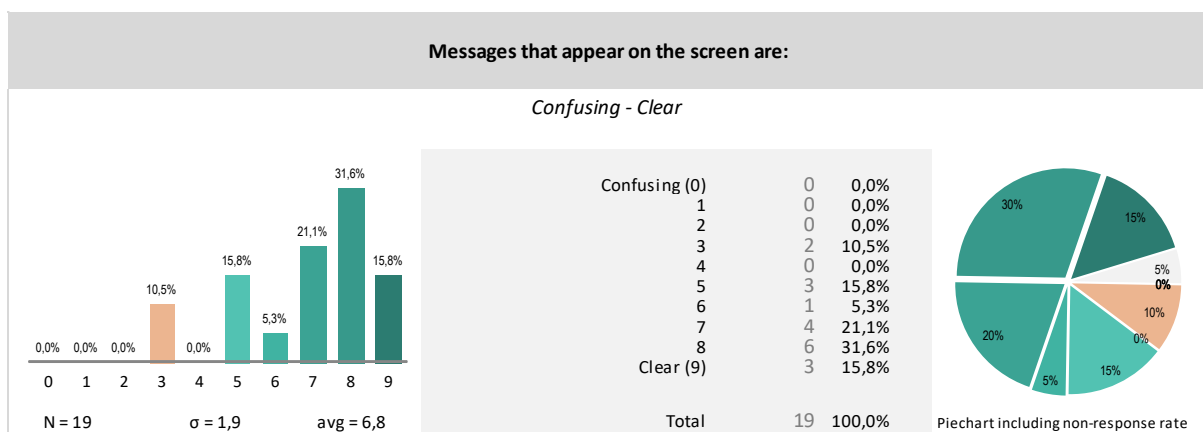


Figure 27: Messages that appear on the screen are (confusing – clear)

With a mean of 6.3 the clarity of “instruction for commands or functions” (j) tilts towards being rated rather “clear”: 33% of users rated this item 8. However, the STD of 1.9 shows that the distribution is rather heterogeneous, ranging from 3-9.

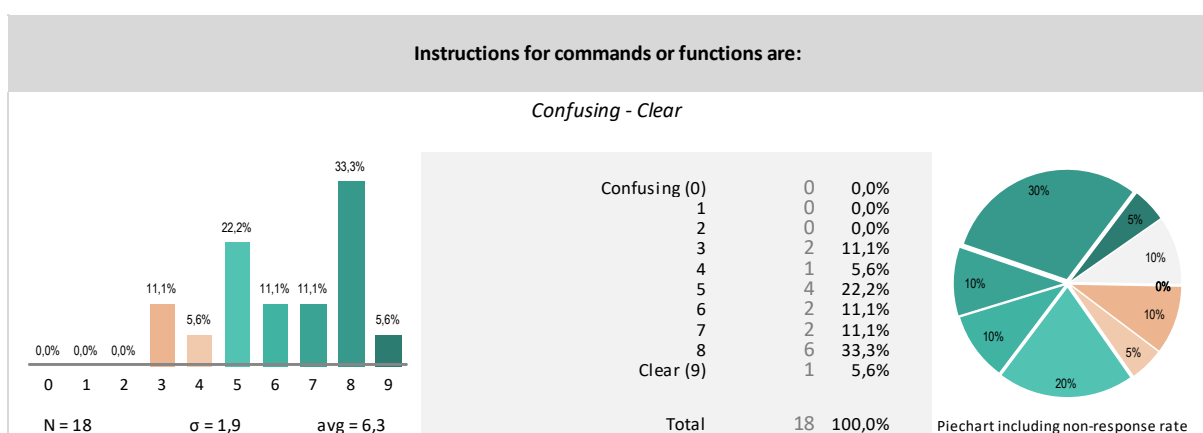


Figure 28: Instructions for commands or functions are (confusing – clear)

The rating of whether “Instructions for correcting errors” are “Confusing” or “Clear” (k), had an average of 5.8 and a standard deviation of 2.4. 1 user rated this feature a 0 and there was a 15% non-response rate, while the other ratings were dispersed between 3 to 9. This heterogeneous item could be further investigated.

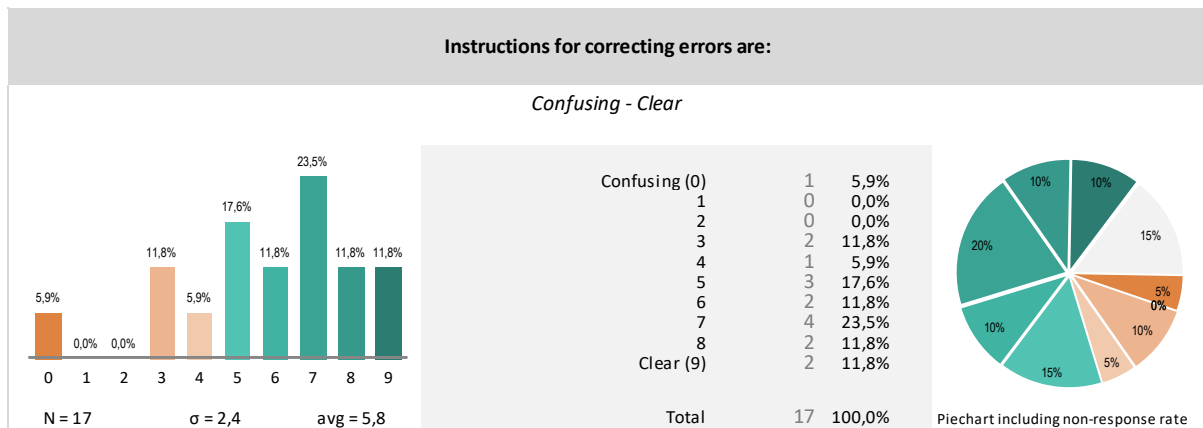


Figure 29: Instructions for correcting errors are (confusing – clear)

When asked to rate whether “The computer keeps the user informed about what it is doing” (l), the average is 6 with an STD of 1.9. 33% (the highest peak) rate the item a 5, indicating that is not always clear what the computer is doing.

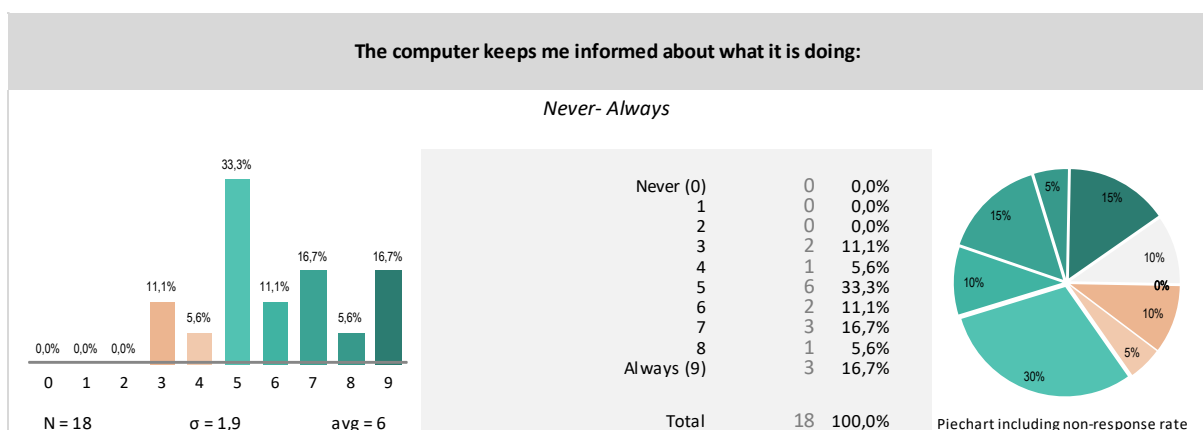


Figure 30: The computer keeps me informed about what it is doing (never – always)

The item if “Animated cursors keep me informed” (m) was rated with an average 5.7 and a standard deviation of 2.2, while 25% of users did not respond. The rather mid-range mean, the large STD and the non-response rate indicate this could be further investigated.

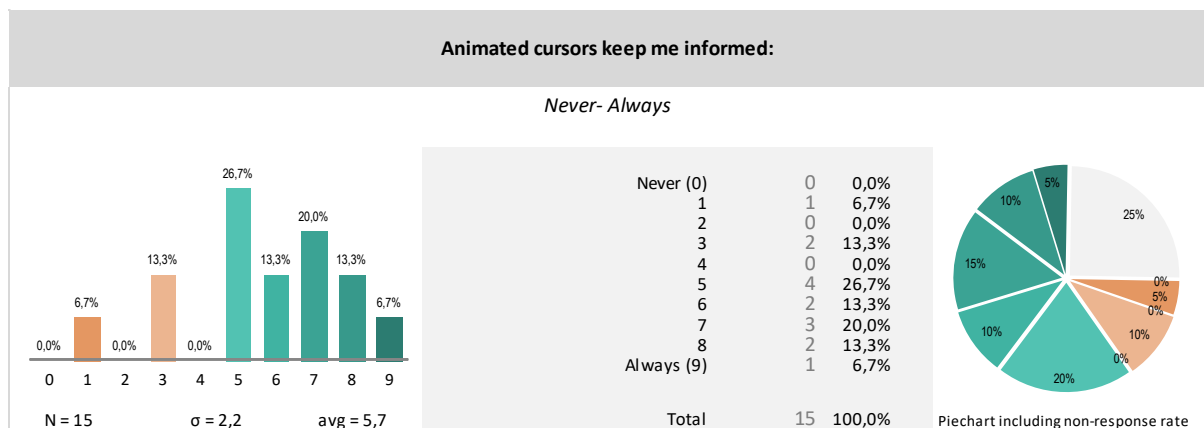


Figure 31: Animated cursors keep me informed (never – always)

“Performing an operation leads to a predictable result” (n) was rated an average of 6.5 (STD=1.7). Generally, users have a positive view for this feature. 1 user did not respond.

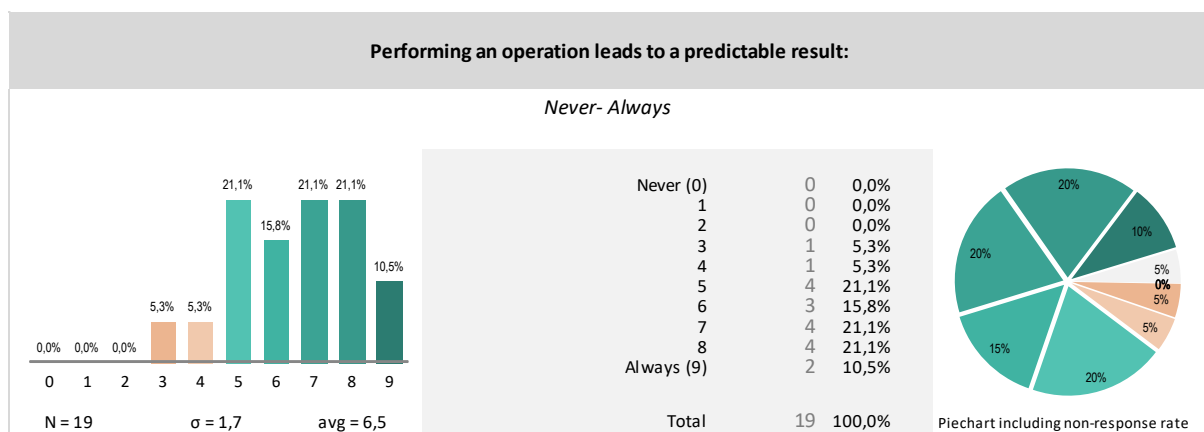


Figure 32: Performing an operation leads to a predictable result (never – always)

Regarding the possibility and ease of “Controlling the amount of feedback” (o), the test users’ ratings mostly ranged from 5-9, with an average of 6.5 and a standard deviation of 1.6, while 15% of users did not respond. Users found it rather easy than impossible to control the amount of feedback given.

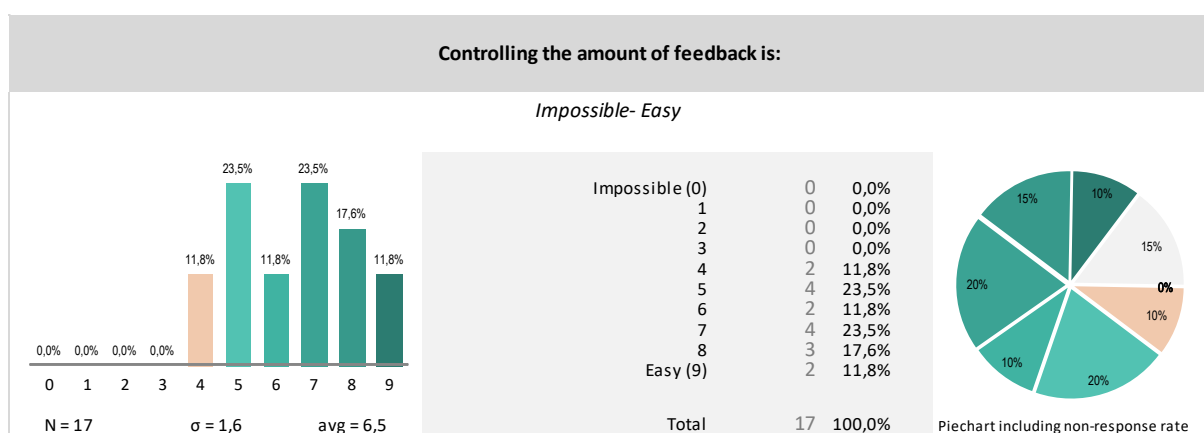


Figure 33: Controlling the amount of feedback is (impossible – easy)

When asked to rate whether “The length of delay between operations” is “Unacceptable” or “Acceptable” (p), the average is 7.8 with a standard deviation of 1.3. 36% of users rated this feature a 9 and 58% rated it 7 and 8. Only 1 user rated this feature a 4 and one user did not respond.

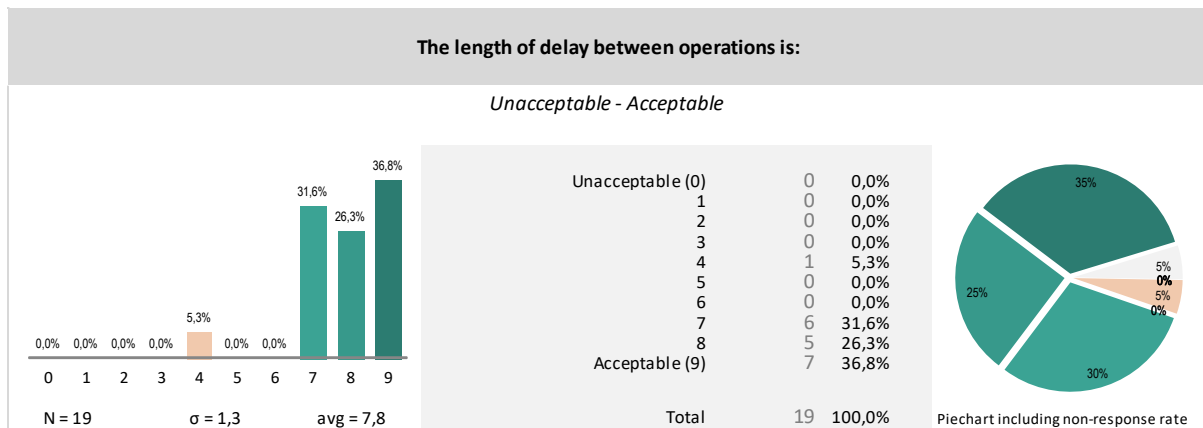


Figure 34: The length of delay between operations is (unacceptable – acceptable)

The rating of “Error messages” (q) being unhelpful or helpful is dispersed across the chart, ranging from 1-9. The standard deviation being 2.4 and the average 6.2, the one could be inclined to say that error messages were rather helpful. However, 18% rated a 1-3 and 20% did not respond.

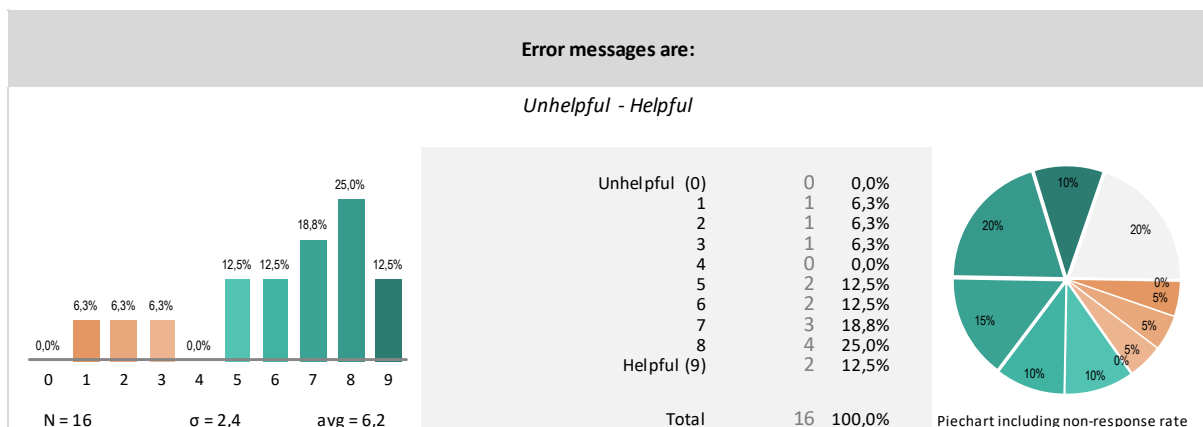


Figure 35: Error messages are (unhelpful – helpful)

“Error messages clarify the problem”, was perceived very heterogeneous with a mean of 5.7 (STD=2.4) and a range from 1-9. Error messages for the clarification of problems could be further investigated.

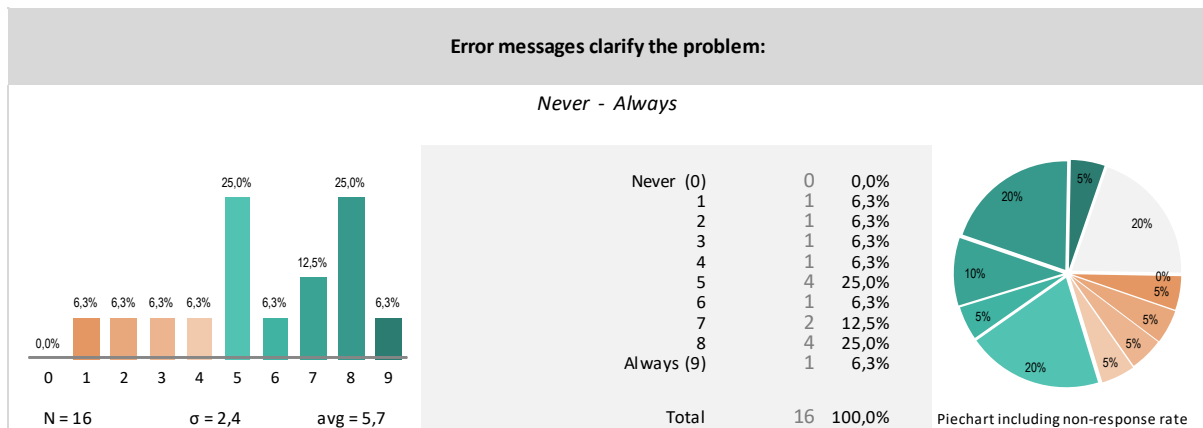


Figure 36: Error messages clarify the problem (never – always)

The “Phrasing of error messages” is rated rather pleasant than unpleasant with a mean rating of 6.1 (STD=1.9). Yet, 25% of users rated it a 2 or 4 and 20% did not respond.

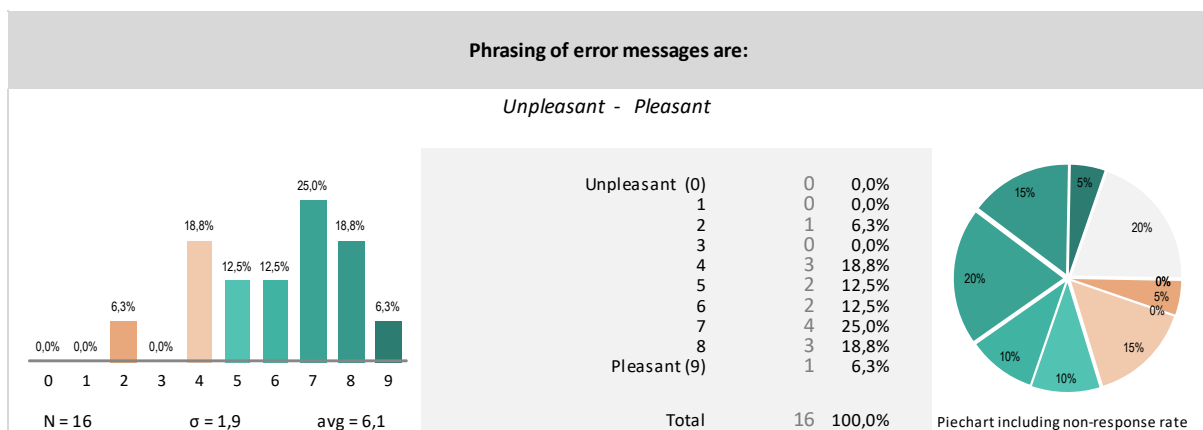


Figure 37: Phrasing of error messages are (unpleasant – pleasant)

1.4. Category 4: Learning

When asked to rate whether “Learning to operate the system is” is “Difficult” or “Easy” (a), users rated this item an average of 5.9 (STD=1.9). 30% of users rated 6 while 20% of users rated this feature a 2, 3 or 4.

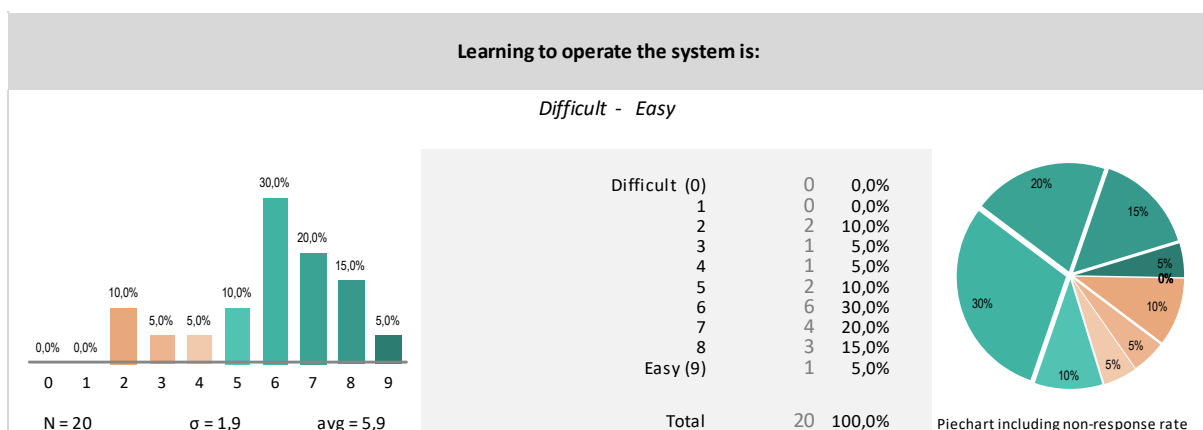


Figure 38: Learning to operate the system is (difficult – easy)

“Getting started” (b) was rated an average of 6.1 (STD=1.6), thus leaning towards being easy rather than difficult. However, there seems to be room for improvement.

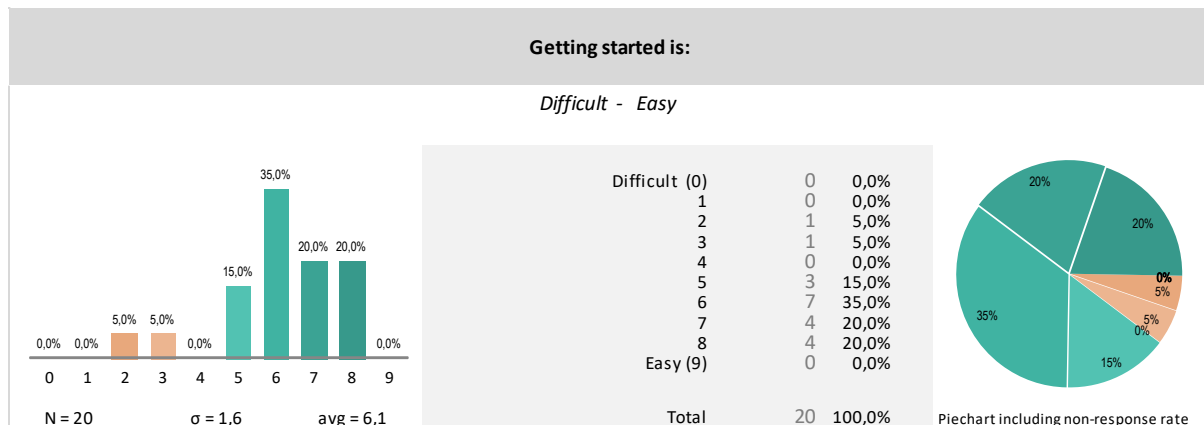


Figure 39: Getting started is (difficult – easy)

“Time to learn to use the system is” (c) was rated with an average of 5.8 (STD=1.5), thus somewhere in the upper middle between “slow” and “fast”. 55% of users rated it 6 or 7.

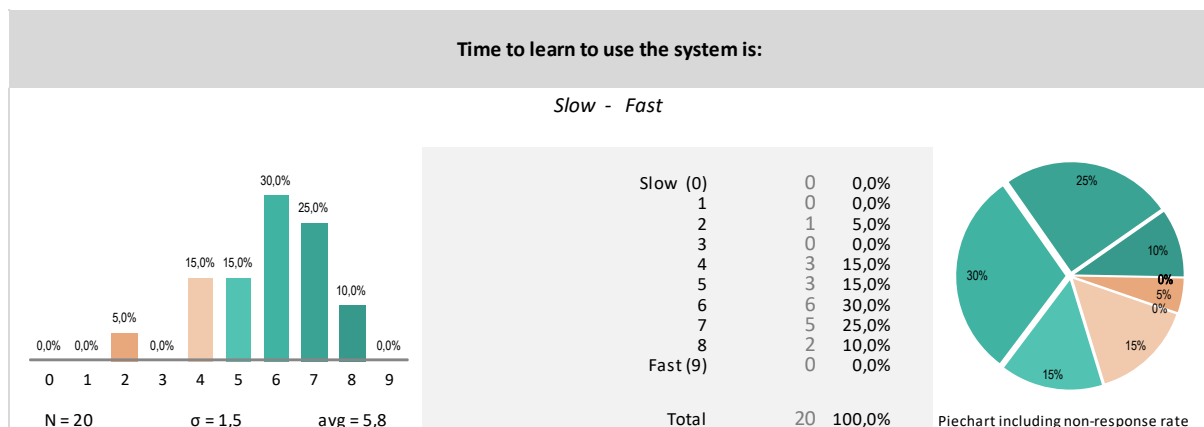


Figure 40: Time to learn to use the system is (slow – fast)

When asked to rate whether “Exploration of features by trial and error” (d), the average rating is 6.2 (STD=1.7). With 50% of users rating it 7 or 8, the trend is towards feeling encouraged to explore more features. However, this could be triggered by the test-setting in which the questionnaire was answered and that test users were naturally keen on exploring the features.

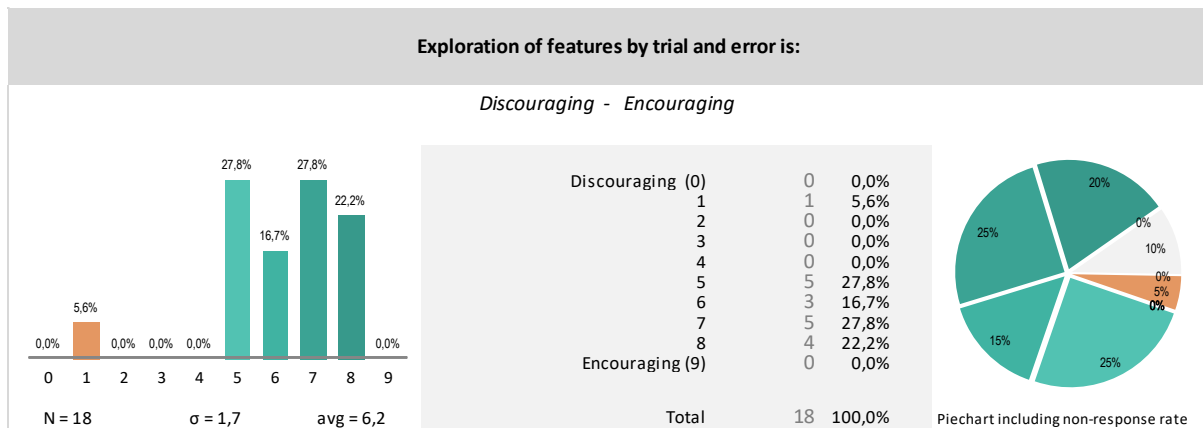


Figure 41: Exploration of features by trial and error is (discouraging – encouraging)

When asked to rate whether the “Number of steps per task” are “Too many” or “Just right” (e) the ratings are quite heterogeneous. The average is 5.4 with a STD of 2.9. 10% of users rated this feature a 0 and another 20% a 1, 2 or 4. However, 50% of all users rated it 7 or higher.

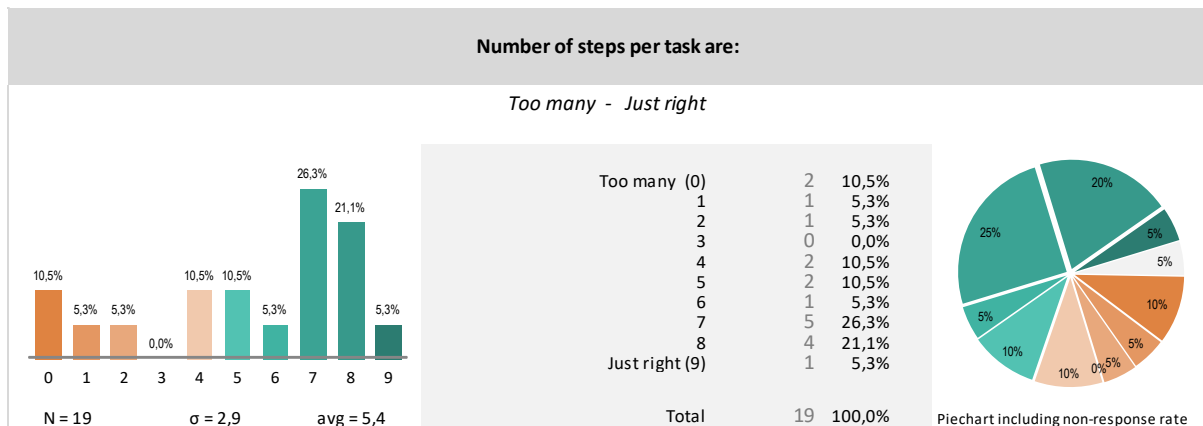


Figure 42: Number of steps per task are (too many – just right)

“Feedback on the completion of a sequence of steps” (f) is rated with an average of 6.1 (STD=1.9). 40% of all users rated feedback on the completion of a sequence of steps as rather unclear or did not respond. It could be clarified why this stands out against 50% of users giving a rating of 7 or 8.

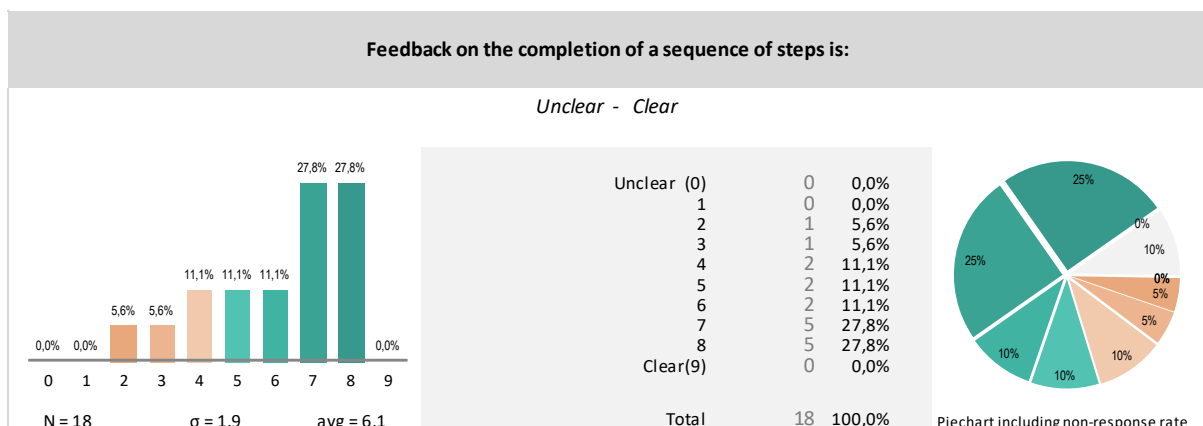


Figure 43: Feedback on the completion of a sequence of steps is (unclear – clear)

1.5. Category 5: Multimedia

Test users rated the “Quality of still pictures/photographs” (a) with an average 8.1 and a standard deviation of 0.8. With all the rating almost equally shared between a 7, 8 and 9, the rating is mostly inclined towards “Good” quality. However, this item had a 40% non-response rate which could be based on the fact that test users could neither relate this QUIS item to specific content shown during the test session, nor did they have routine experience with the system that could have helped them answer the item



Figure 44: Quality of still pictures/photographs was (bad – good)

Similarly to the above, test users rated the fuzziness and clarity of “Pictures/Photos” (b) with an average of 7.8 and a standard deviation of 1. With all the ratings almost equally shared between a 7, 8, 9, this chart is inclined towards “Clear” pictures/photos. However, this item had a 40% non-response rate which could be based on the fact that test users could neither relate this QUIS item to specific content shown during the test session, nor did they have routine experience with the system that could have helped them answer the item

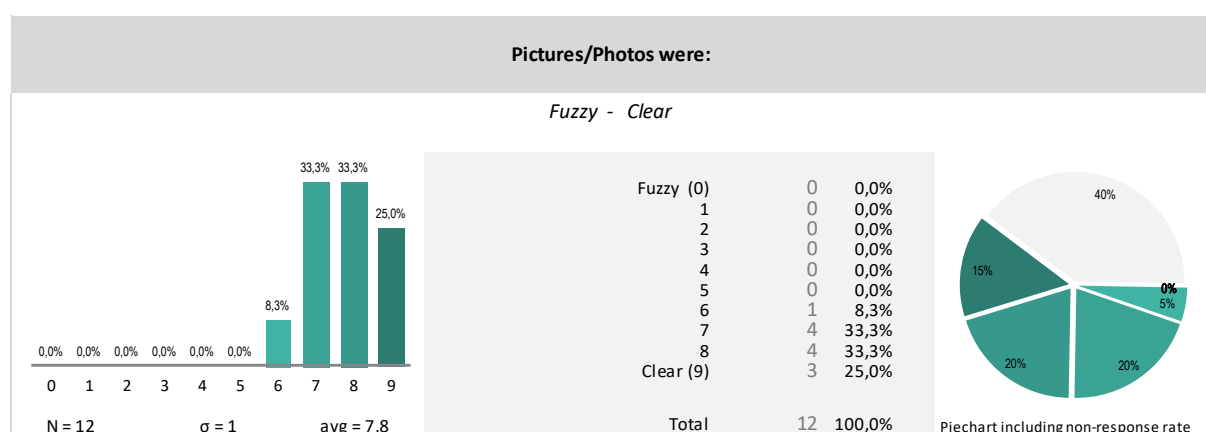


Figure 45: Pictures/Photos were (fuzzy – clear)

Regarding the dimness and brightness of the “Picture/Photo” (c), the average is 7.9 and the standard deviation 0.9. The ratings of 10 users are again equally shared between a 7, 8 and 9. However, this item had a 50% non-response rate which could be based on the fact that test users could neither relate

this QUIS item to specific content shown during the test session, nor did they have routine experience with the system that could have helped them answer the item

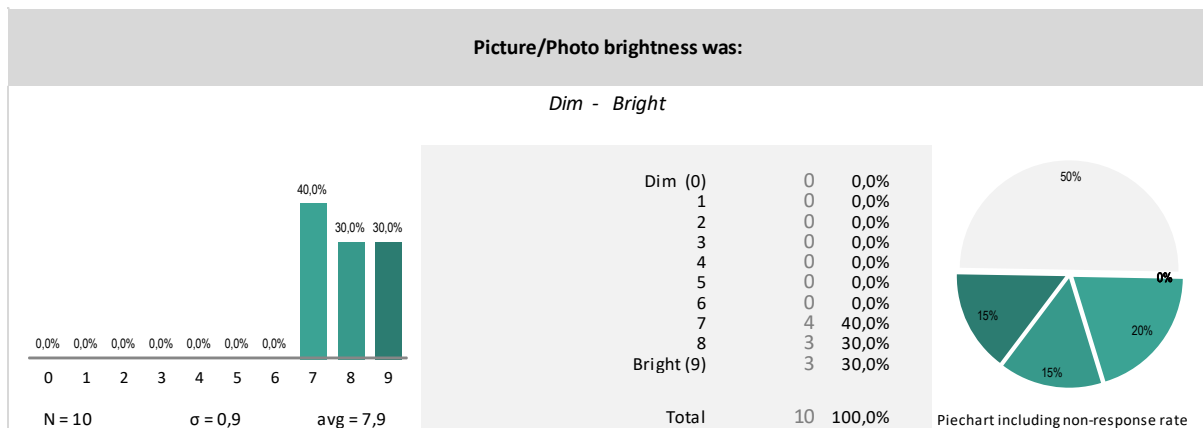


Figure 46: Picture/Photo brightness was (dim – bright)

With a response rate of only 25% the “Quality of movies” (d) was rated an average of 5.2 with a STD of 3.3. It is assumed that the rather low response-rate could be based on the fact that no videos were shown during the test sessions.

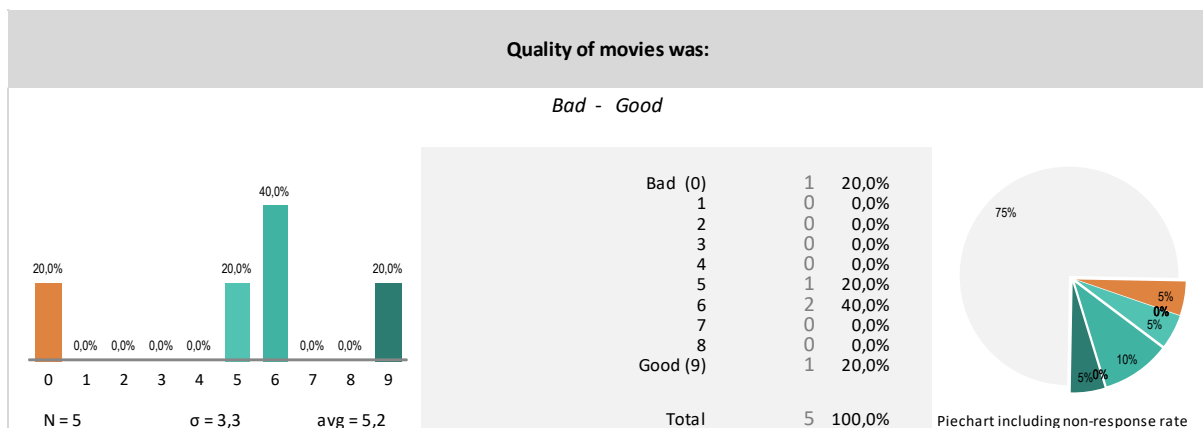


Figure 47: Quality of movies was (bad – good)

The equal rating to the above repeated in the dimness and brightness of the “movie images” (e). Standard deviation is 3.3 and the average 5.2. The response rate was again as low as 25%.

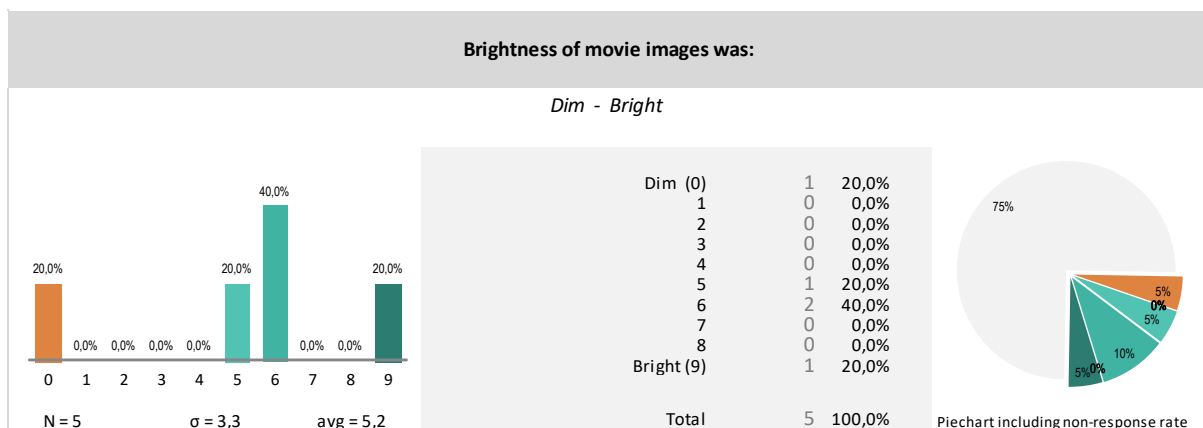


Figure 48: Brightness of movie images was (dim – bright)

The adequacy of “Movie window size” (f) is rated equally to the above. The average rating is 5.2 with a STD of 3.3. The response rate was as low as 25%.

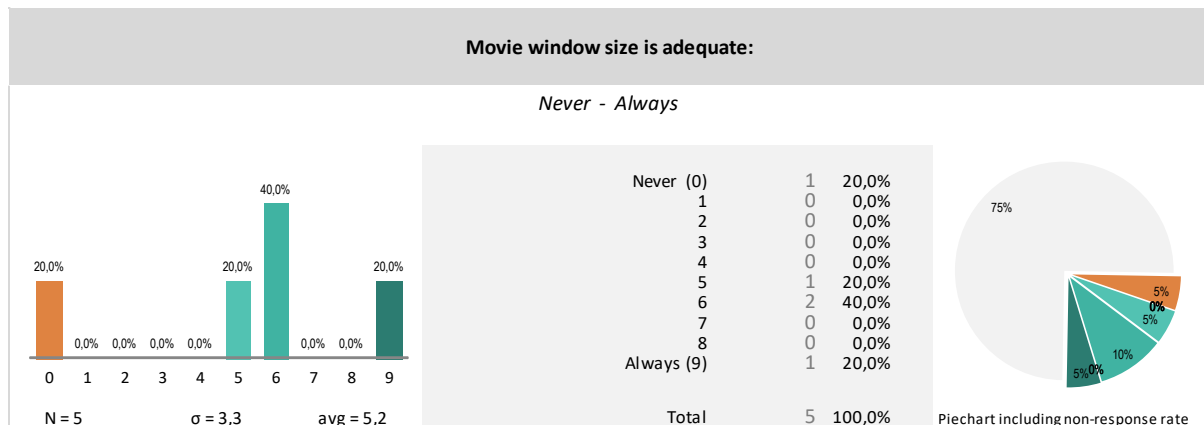


Figure 49: Movie window size is adequate (never – always)

Regarding the audibility and inaudibility of the “Sound output” (g), the standard deviation is 3.9 and the mean is as low as 4. The 40% of users rating sound output audibility 0 goes hand in hand with the low response rate of 25% and the fact that audio was not used during the test sessions.

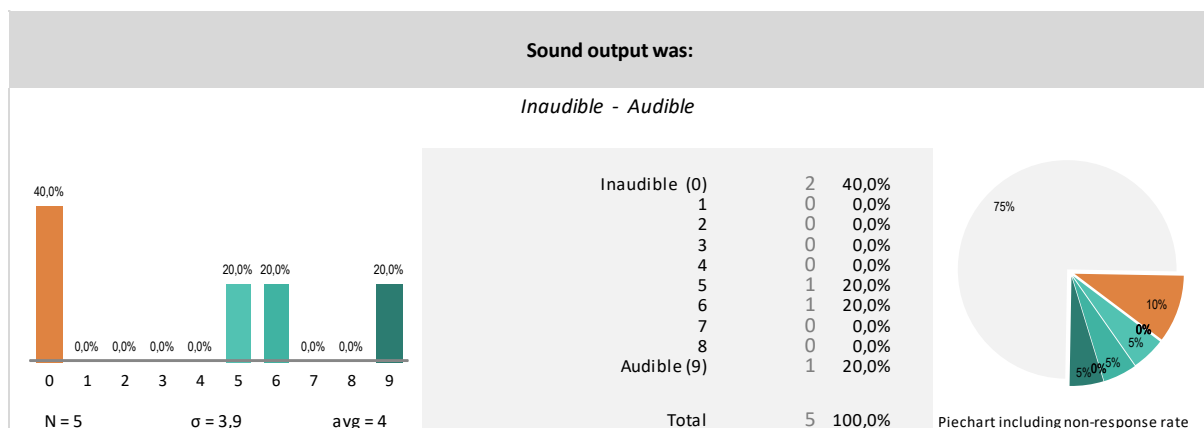


Figure 50: Sound output was (inaudible – audible)

Regarding the choppiness of the “Sound output” (g), the standard deviation is 3.9 and the mean is as low as 4. The 40% of users rating sound output 0 goes hand in hand with the low response rate of 25% and the fact that audio was not used during the test sessions.

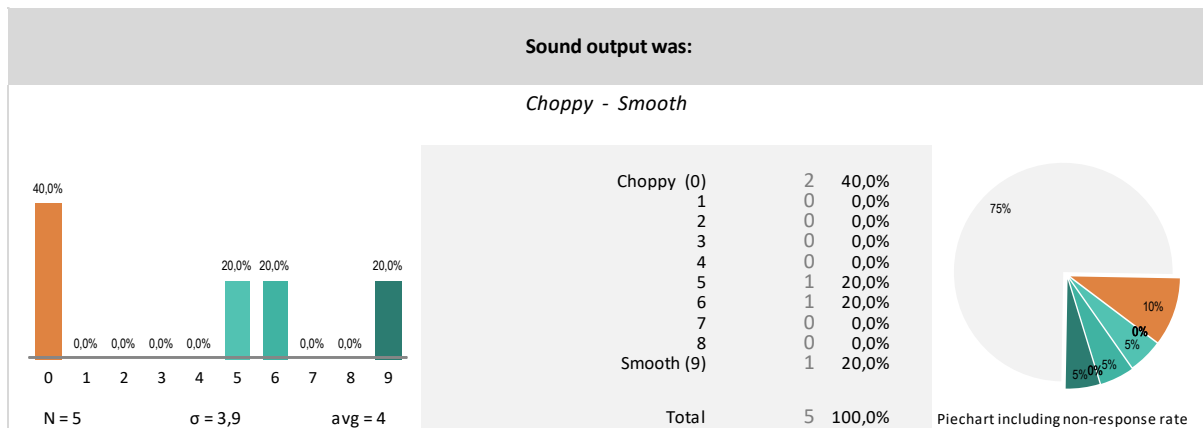


Figure 51: Sound output was (choppy – smooth)

When asked to rate whether “Colours used” is “Unnatural” or “Natural” (i), the average is 5.8 with a standard deviation of 3.3. The response rate was as low as 30% which is odd since the colours used could also include more generally the colours used for the C3DP platform. A higher response rate was expected here and possibly the question could be rephrased for further testing during the technology trial.

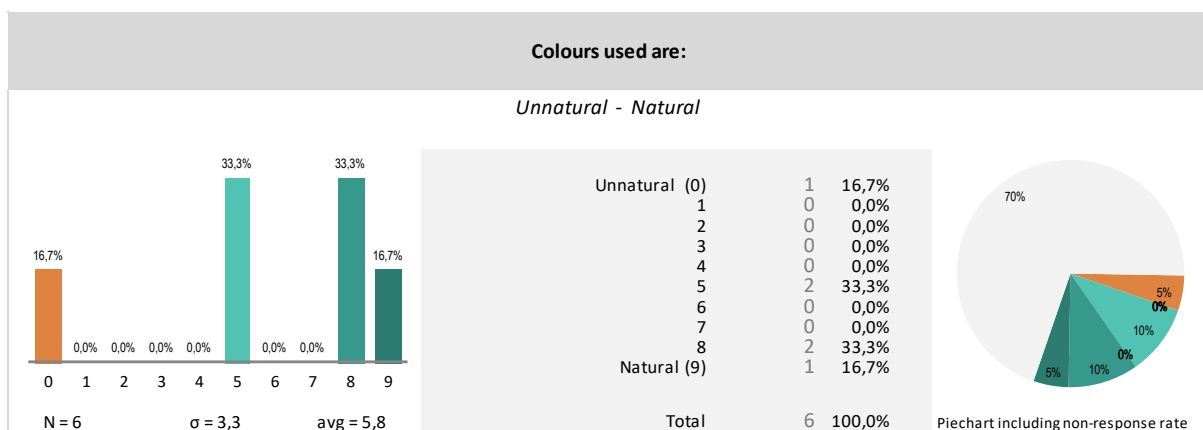


Figure 52: Colours used are (unnatural – natural)

When asked to rate whether “Colours available” are “Inadequate” or “Adequate” (i), the average is 5.5 with a standard deviation of 3.1. The response rate was as low as 30% which is odd since the colours used could also include more generally the colours used for the C3DP platform. A higher response rate was expected here and possibly the question could be rephrased for further testing during the technology trial.

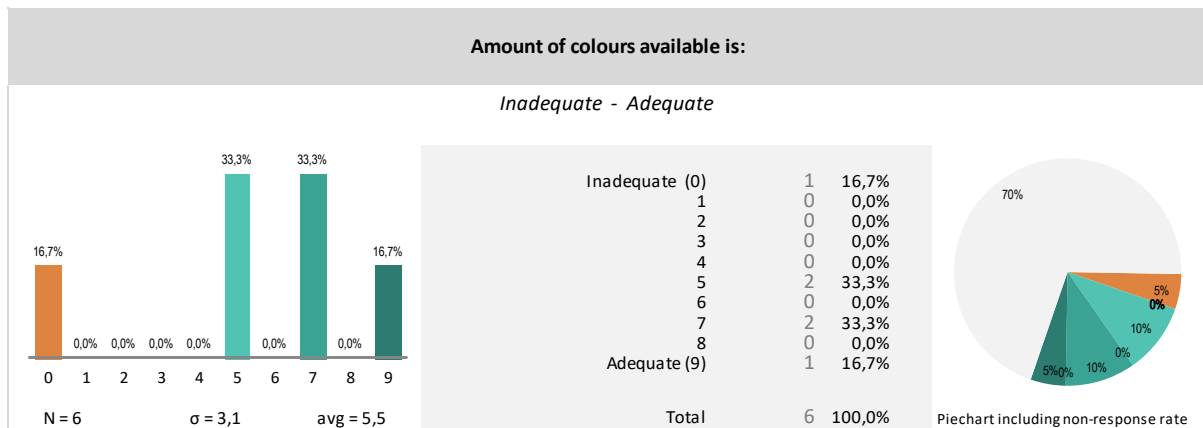


Figure 53: Amount of colours available is (inadequate – adequate)

1.6. Category 6: Tutorials

Test users rated the uselessness and helpfulness of the “The training workshop” (a) with an average 7.3 and a standard deviation of 1.7. 65% of users rated the training workshop a 8 or 9, implying it was generally perceived as helpful.

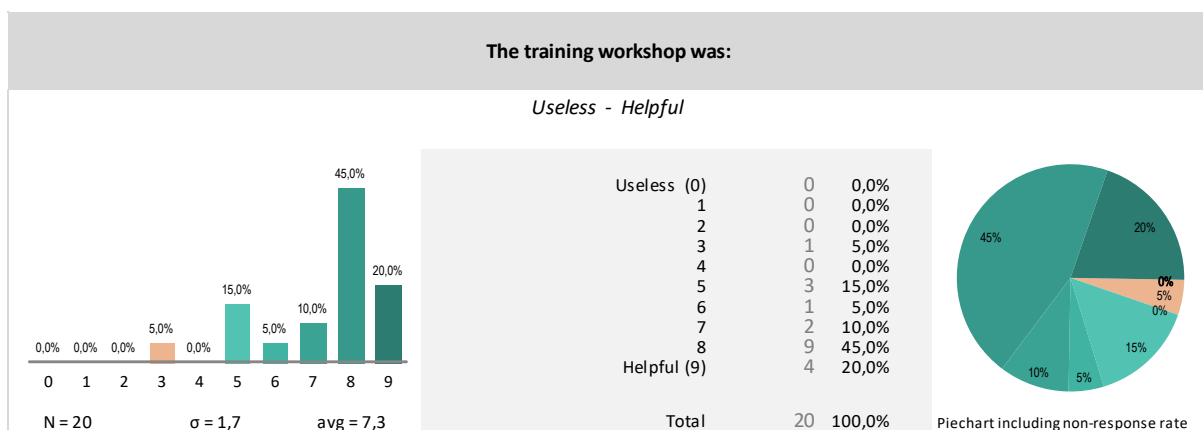


Figure 54: The training workshop was (useless – helpful)

1.7. Category 7: User manual

When asked to rate whether “The terminology used in the manuals” is “Confusing” or “Clear” (a), the user manual is rated an average of 6.1 with a STD of 2. 50% of users rated the manual terminology 7 or higher, implying that terminology was perceived rather clear. However, 30% also rated it a 3 or 4, indicating that there are some confusing parts in the manual terminology.

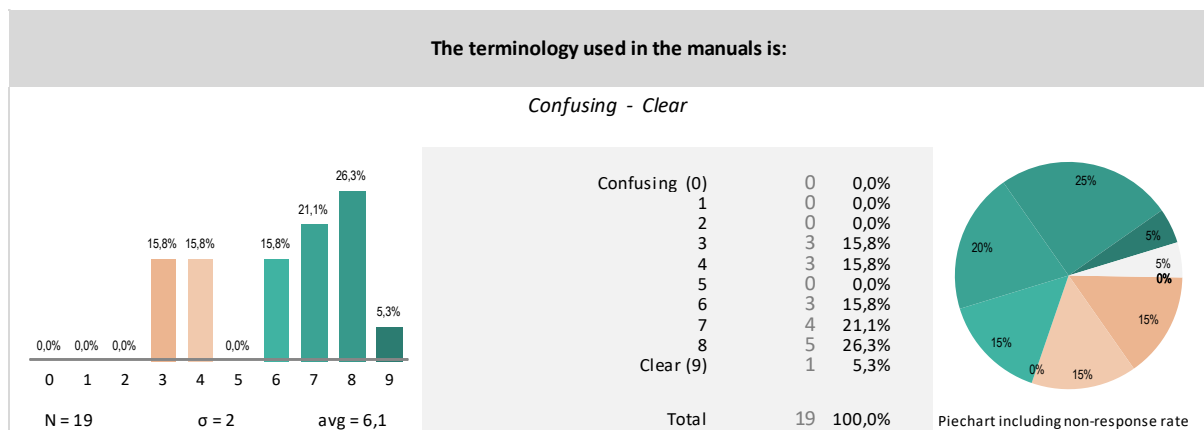


Figure 55: The terminology used in the manuals is (confusing – clear)

Users rated “The information from the manual is easily understood” (b) with an average 5.9 and a STD 2. Ratings range from 2-9, implying that the manual could use some work to ensure it can be more easily understood by users.

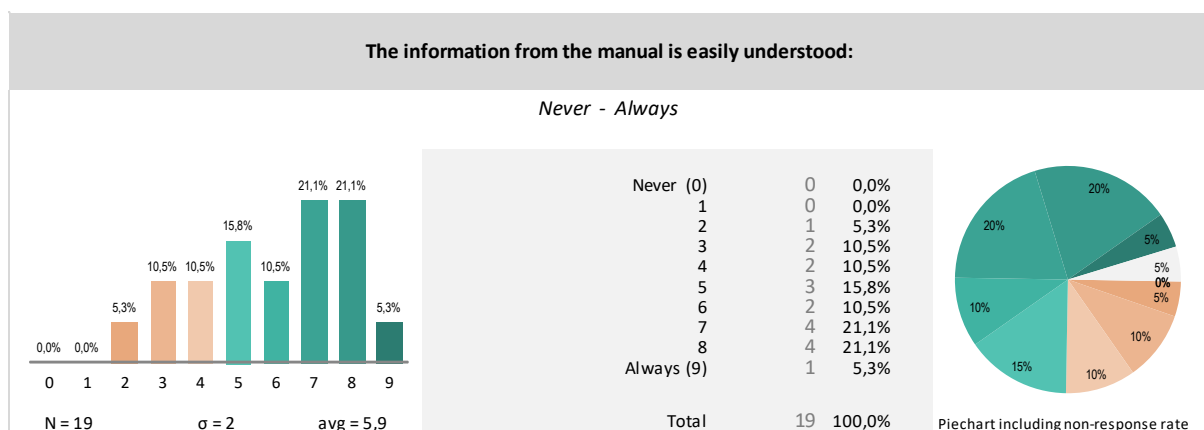


Figure 56: The information from the manual is easily understood (never – always)

When asked to rate if “Finding a solution to a problem using the manual” (c) is impossible or easy, the manual is rated an average of 6.1 with a standard deviation of 2. 40% of all users rate it a 7 or higher, while 30% rate it between 2 and 5. In addition, 15% of users gave no response. It is debatable if users had no need to find a solution using the manual or if the manual did not have sufficient quality to provide easy ways of finding solutions.

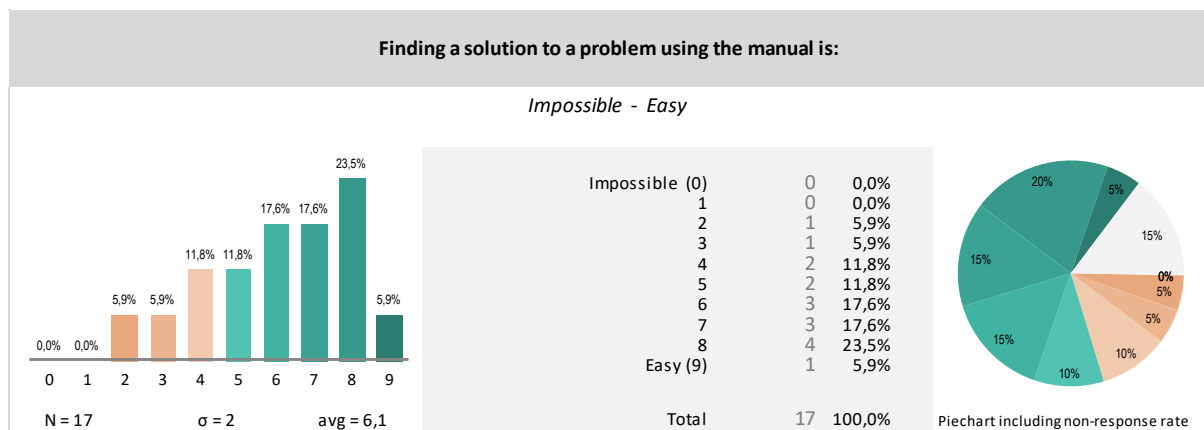


Figure 57: Finding a solution to a problem using the manual is (impossible – easy)

When asked to rate whether “Amount of help given” (d) is “Adequate” or “Inadequate” users’ rating had a mean of 6.5 with a STD of 2. 55% of all users rated it 7 or higher, indicating that the amount of help is adequate for them. However, 20% rated it between 2-5 and another 15% of users did not respond, indicating they wished for help through the manual or could not answer the question.

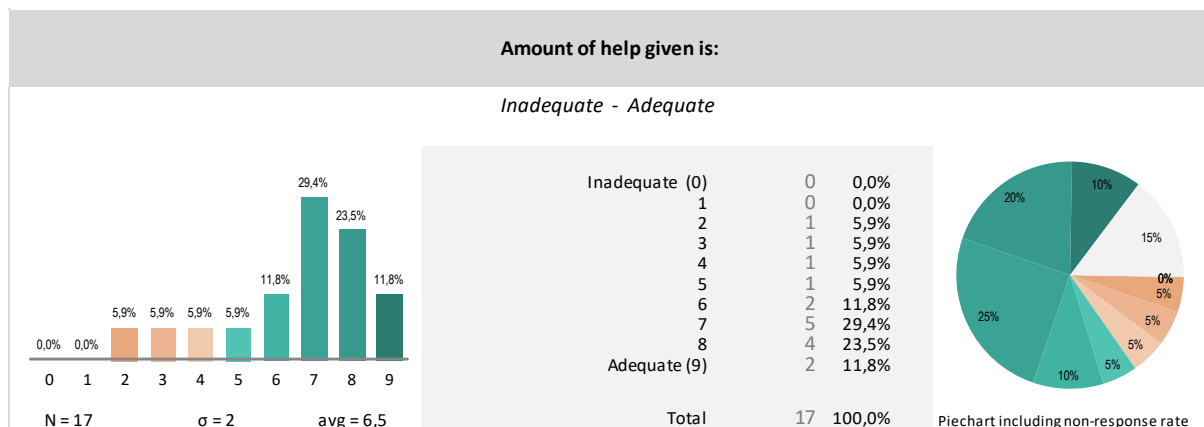


Figure 58: Amount of help given is (inadequate – adequate)

Regarding how clear or confusing the “Placement of help messages on the screen” is (e), users’ rating was very heterogeneous, ranging between 0-9 with a mean of 5.4 and a SDT of 2.8. It could be further investigated why the result is so dispersed and why 40% of all users were confused by the placement of help messages or did not respond.

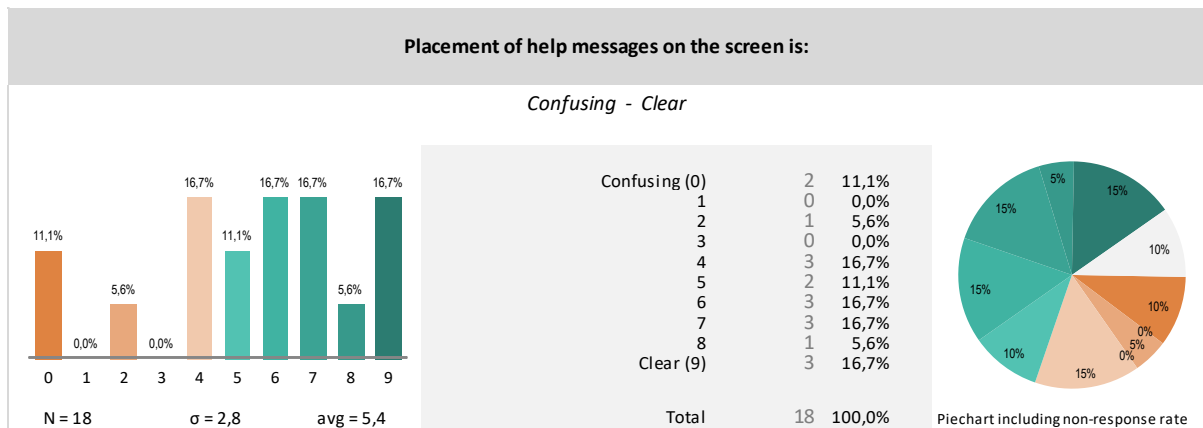


Figure 59: Placement of help messages on the screen is (confusing – clear)

An average of 4.4 with a STD of 3.2 is the rating result of how difficult or easy “Accessing help messages” (f) was. While 15% of users did not respond, 24% rated the access of help messages difficult (0) and another 20% rated it between 2-4. It could be further investigated why the result is so dispersed and assess why help message was perceived difficult by many users.

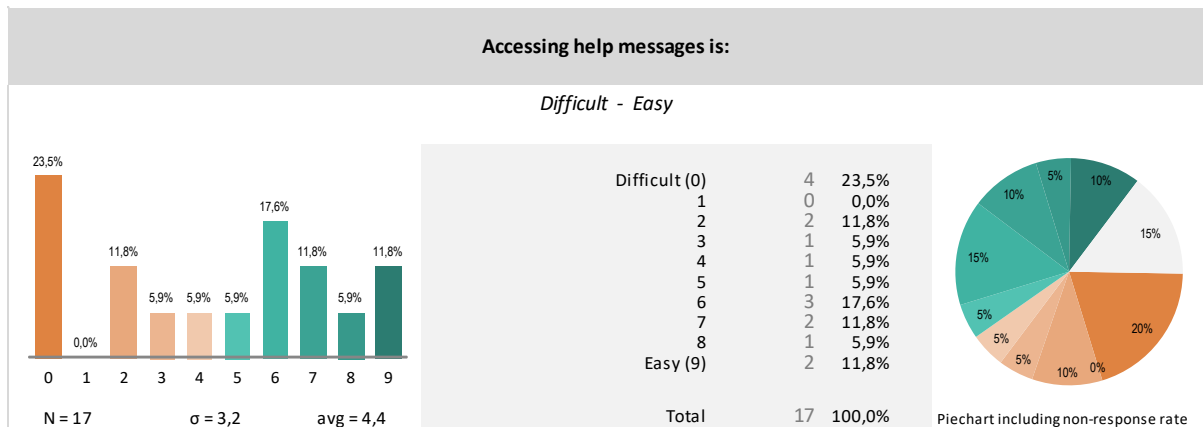


Figure 60: Accessing help messages is (difficult – easy)

1.8. Category 8: System capabilities

When asked to rate whether “System speed is” is “Too slow” or “Fast enough” (a), the average is 8 with a STD of 1. 70% of user ratings were between 8 and 9.

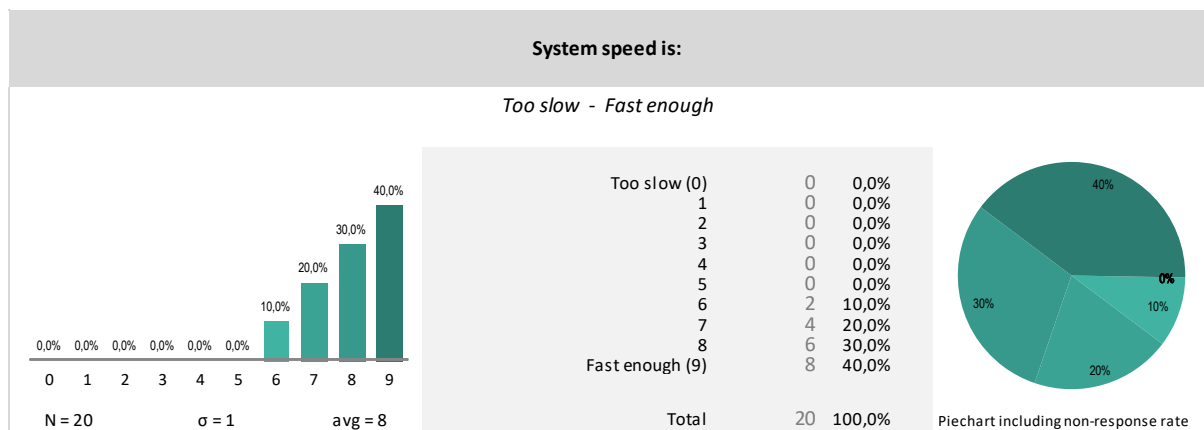


Figure 61: System speed is (too slow – fast enough)

Regarding the “Response time for most operations” (b) and whether they are “Too Slow” or “Fast enough” the users rated it an average of 7.6 and a STD of 1.9. While the rating was generally rather positive, the rather large STD was caused by an outlier.

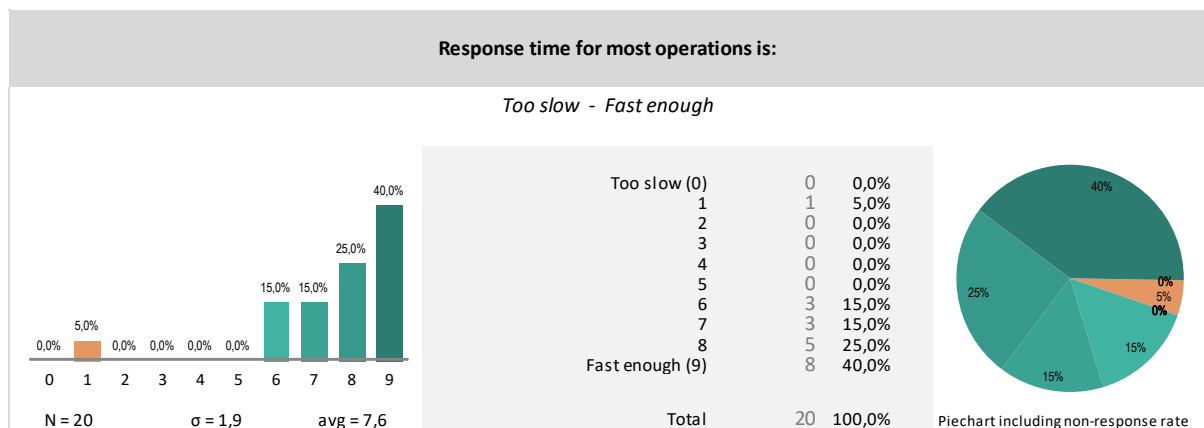


Figure 62: Response time for most operations is (too slow – fast enough)

“System reliability” was rated on a 0-9 scale from “never” to “always”. The mean rating of 7 with a STD of 1.6 indicate that the system is experienced as very reliable.

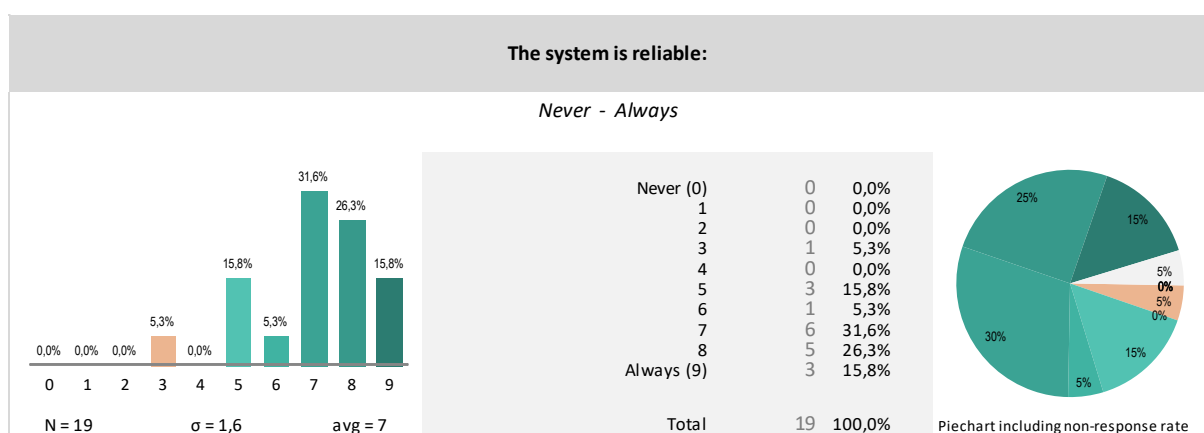


Figure 63: The system is reliable (never – always)

Test users rated whether the “Operations” (d) are “Undependable” or “Dependable” with an average of 6.9 and a STD of 1.9. The rating is mostly inclined towards dependable operations. However, 2 users rated this feature a 3 and 2 users did not respond.

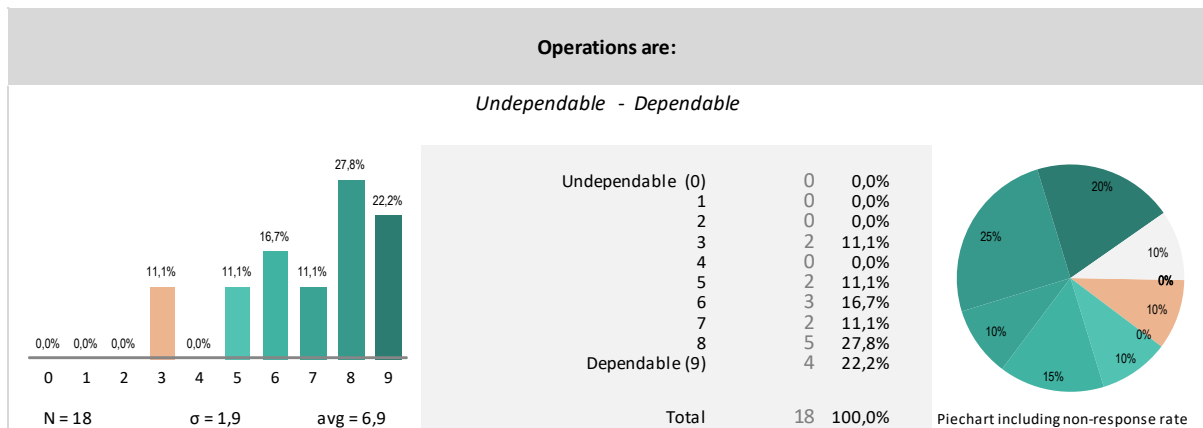


Figure 64: Operations are (undependable – dependable)

The rating was less clear on the occurrence of “System failures” (e). While the rating is inclined towards system failures occurring seldom (the average is 6.8 with a STD of 2.3), 40% of all users rated it only a 2, 4 or 5.

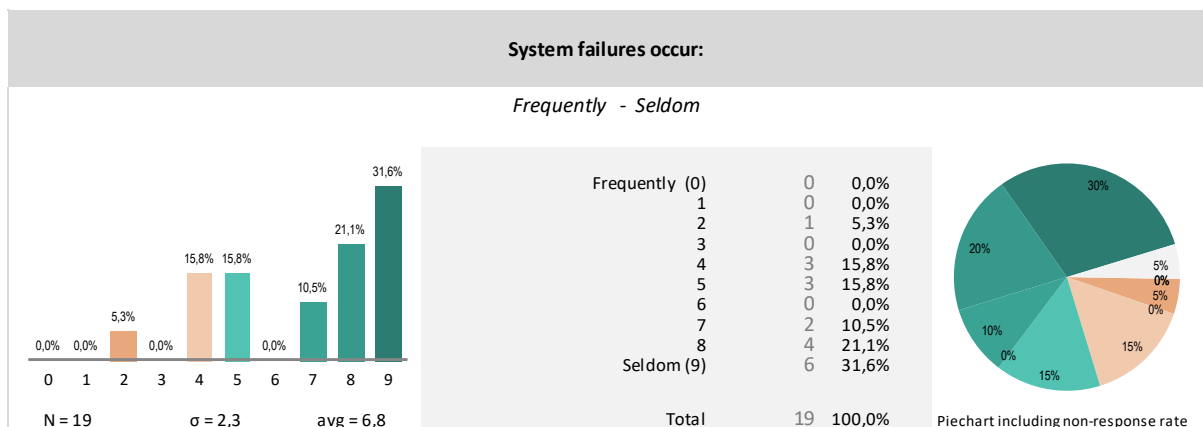


Figure 65: System failures occur (frequently – seldom)

When asked to rate whether “The system warns me about potential problems” (f) the responses are very heterogeneously dispersed, ranging from 0 (“Never”) to 9 (“Always”). The average is 5.1 with a standard deviation of 2.8. 25% of all users did not respond and only 58% rate it 5 or higher. It could be further investigated why users thought they would not be warned about potential problems and why the non-response rate was quite high.

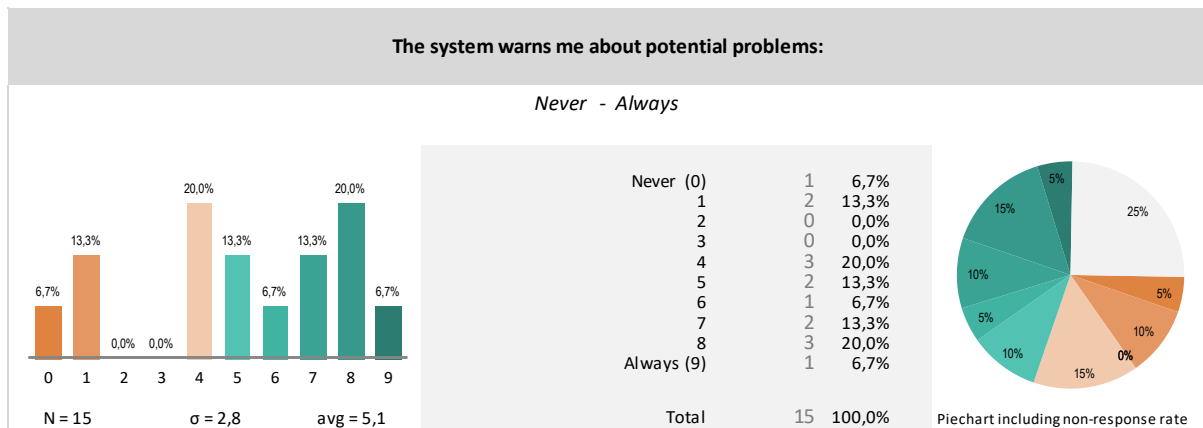


Figure 66: The system warns me about potential problems (never – always)

“Correcting my mistakes” (g), was rated 6.5 in the mean with a STD of 1.5. 65% of users rated the easiness to correct mistakes 7 or higher.

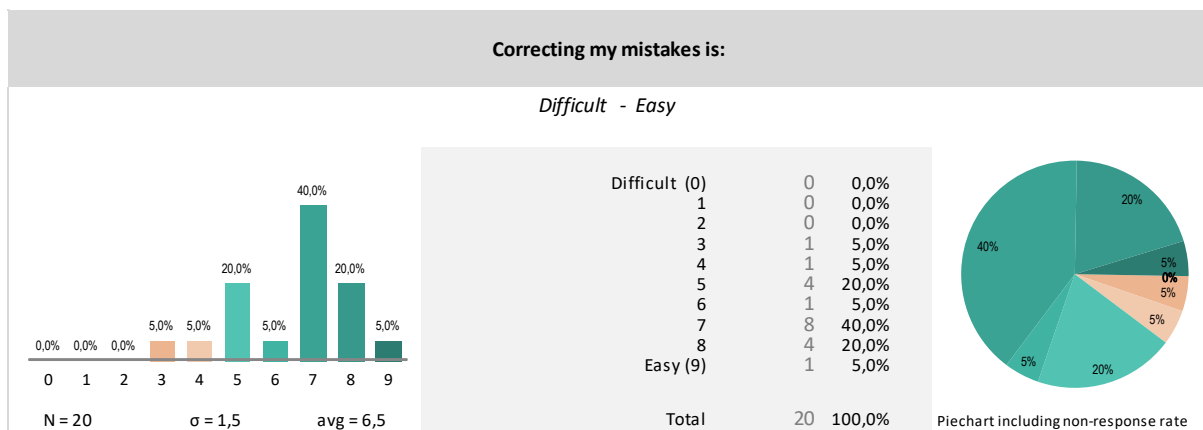


Figure 67: Correcting my mistakes is (difficult – easy)

When asked whether “Correcting typos is” “Complex” or “Simple” (h), the average is 6.9 with a standard deviation of 1.6. While 15% of all users did not respond, 60% rated the easiness to correct typos a 7 or higher (“simple”).

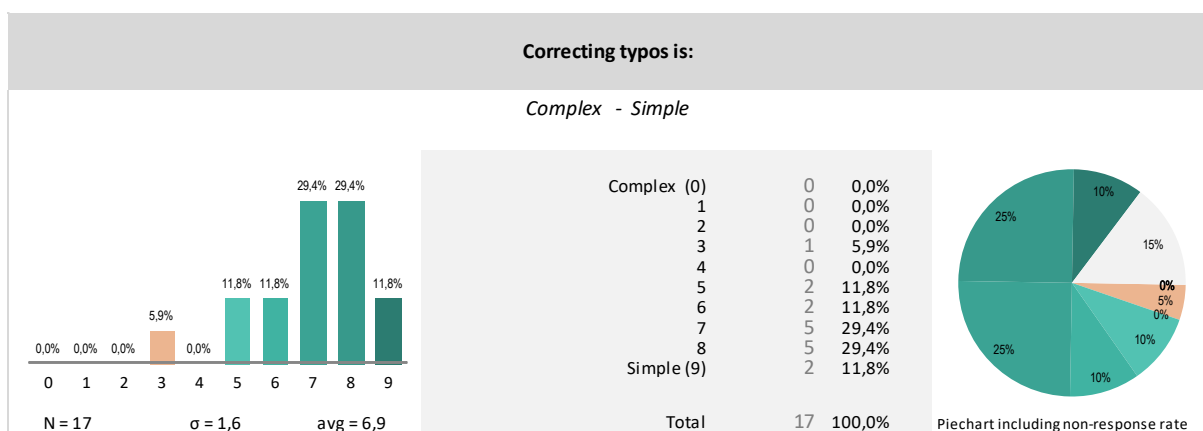


Figure 68: Correcting typos is (complex – simple)

The ratings of “The ability to undo operations” ranged from 2-9 with an average of 6.1 and a STD of 2.2. The large range and large STD suggested to check why users perceived the adequacy to undo operations so differently.

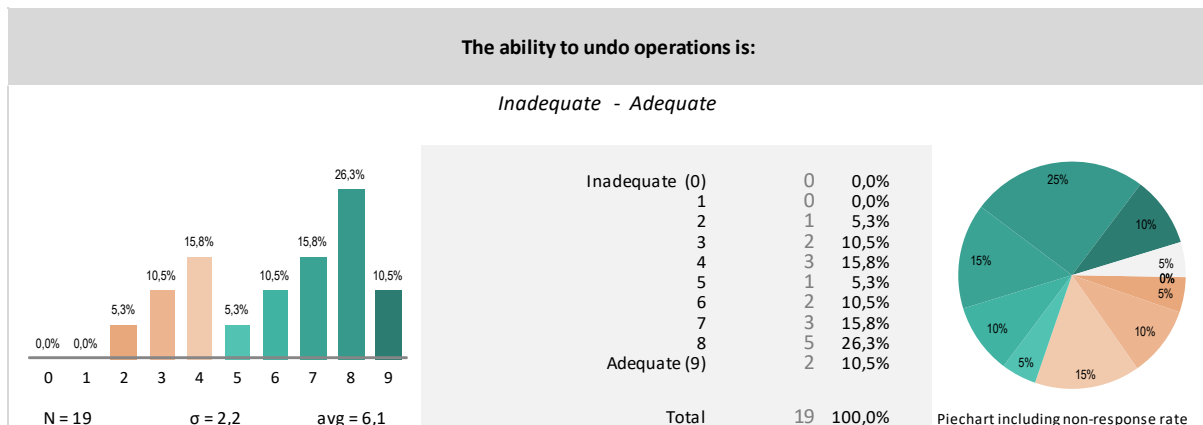


Figure 69: The ability to undo operations is (inadequate – adequate)

Users were asked if “The ease of operation depends on their level of experience” (j) on a 0-9 scale from “never” to “always”. The mean rating is 7.1 with a STD of 1.4. As much as 80% of ratings lie between 6-8 with an exception of 5% of respondents rating this feature a 3,

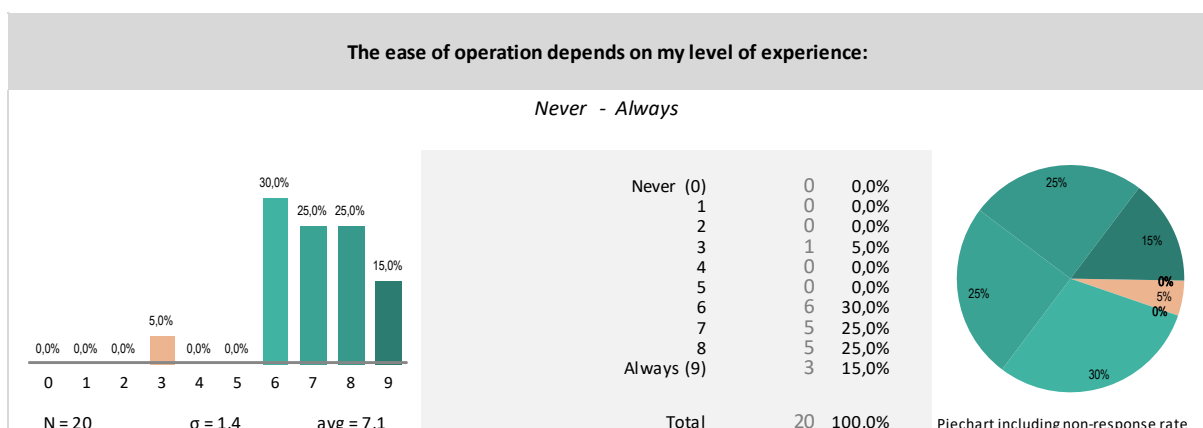


Figure 70: The ease of operation depends on my level of experience (never – always)

Test users rated “I can accomplish tasks knowing only a few commands” (k) with an average 6.4 and a STD of 1.7. The rating is inclined towards “Easily” with 55% of all users rating it 7 or higher. However, 10% rated it only a 3 and 5% did not respond.

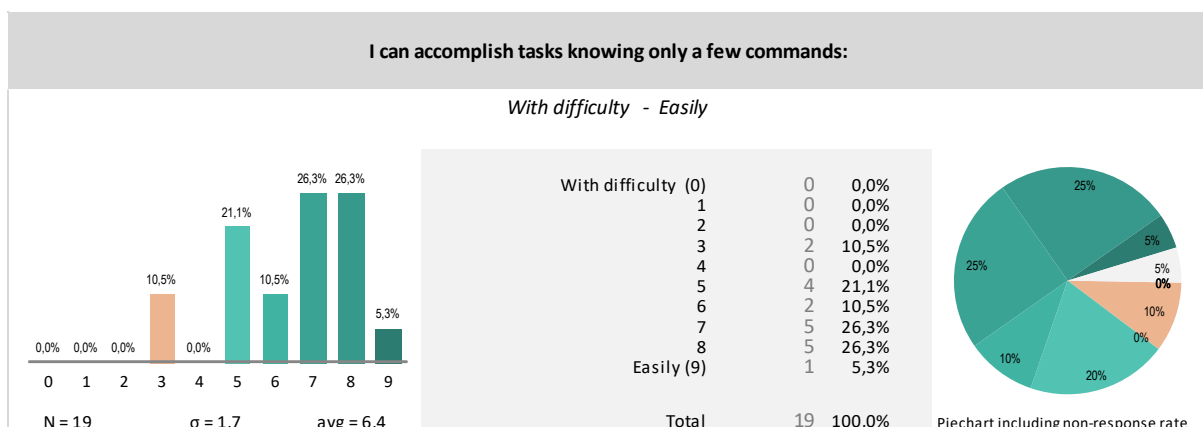


Figure 71: I can accomplish tasks knowing only a few commands (with difficulty – easily)

1.9. Category 9: Software installation

When asked to rate “The speed of setting up (installing) the software” (a), the average is 7.4 and the standard deviation 3.3. While 85% of respondents rated it 8 or 9 (the installation being very fast), 14% rated it 0 and 65% or all users did not respond to this item in the first place. This may be because test users did not themselves install the software.

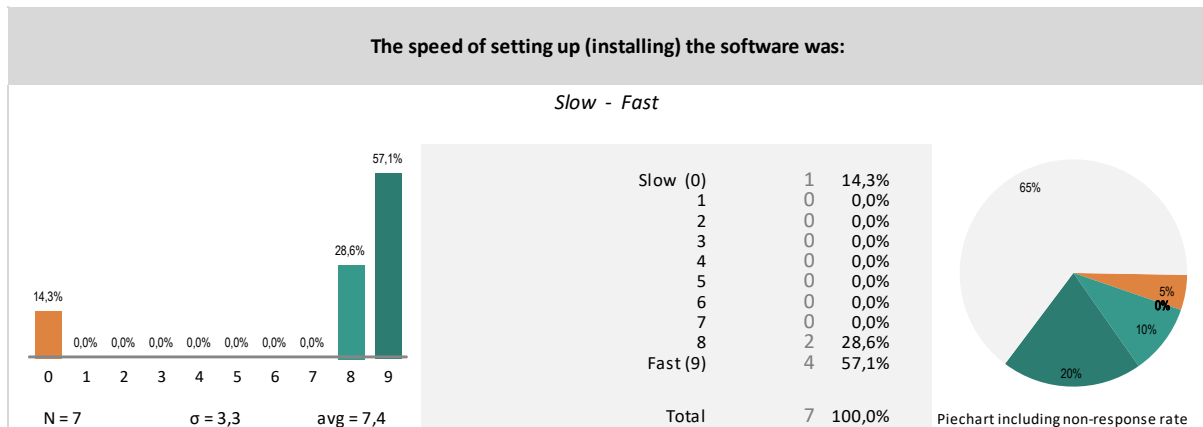


Figure 72: The speed of setting up (installing) the software was (slow – fast)

The rating of whether “I get informed of the installation progress” (b) was perceived quite differently ranging from 0-9 with an average of 5 and a STD of 3.7. 65% of all users did not respond to this item. This may be because test users did not themselves install the software.

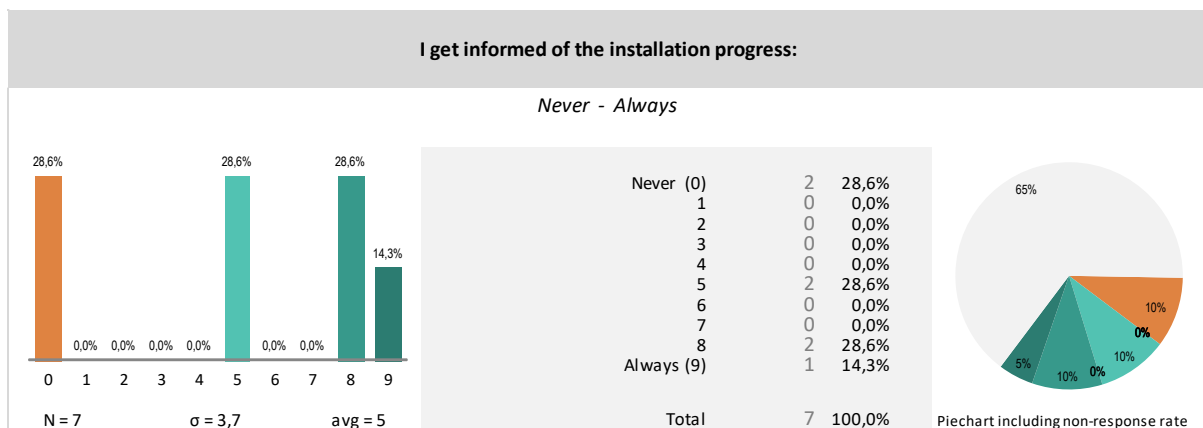


Figure 73: I get informed of the installation progress (never – always)

Whether “The installation gives meaningful explanation when failures occur” (c) was rated with a mean of 4.5 and a STD of 3.5. 70% of all users did not respond to this item. This may be because test users did not themselves install the software.

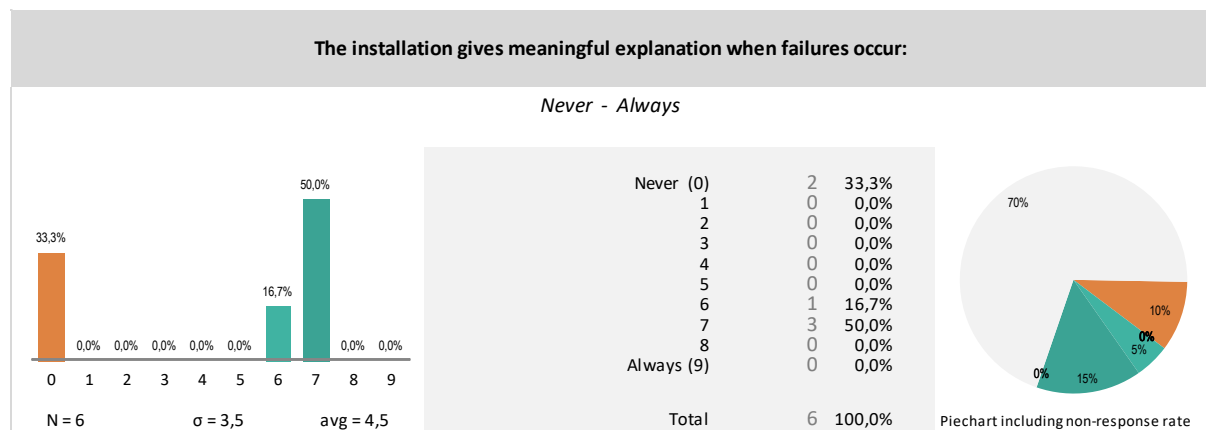


Figure 74: The installation gives meaningful explanation when failures occur (never – always)

1.10. Recommendations for further C3DP development

It is recommended that technical partners who develop the C3DP platform further investigate the following usability criteria that were rated lower than 6 in the mean and that had a STD larger than 2 or had a non-response rate of more than 15%,

Table 1: List of usability criteria recommended for further C3DP development

Usability item	Mean < 6	STD > 2	Non-response rate > 15%
Figure 3: I find the C3-Cloud System (frustrating – satisfying)	X		
Figure 6: I find the C3-Cloud System having (having inadequate power – having adequate power)		X	
Figure 8: Characters on the computer screen are		X	
Figure 18: Progression of work-related tasks is	X	X	
Figure 29: Instructions for correcting errors are (confusing – clear)	X	X	
Figure 31: Animated cursors keep me informed (never – always)	X	X	X
Figure 35: Error messages are (unhelpful – helpful)		X	X
Figure 36: Error messages clarify the problem (never – always)	X	X	X
Figure 37: Phrasing of error messages are (unpleasant – pleasant)			X
Figure 38: Learning to operate the system is (difficult – easy)	X		
Figure 40: Time to learn to use the system is (slow – fast)	X		
Figure 42: Number of steps per task are (too many – just right)	X	X	
Figure 44: Quality of still pictures/photographs was (bad – good)			X

Usability item	Mean < 6	STD > 2	Non-response rate > 15%
Figure 45: Pictures/Photos were (fuzzy – clear)			X
Figure 46: Picture/Photo brightness was (dim – bright)			X
Figure 47: Quality of movies was (bad – good)	X	X	X
Figure 48: Brightness of movie images was (dim – bright)	X	X	X
Figure 49: Movie window size is adequate (never – always)	X	X	X
Figure 50: Sound output was (inaudible – audible)	X	X	X
Figure 51: Sound output was (choppy – smooth)	X	X	X
Figure 52: Colours used are (unnatural – natural)	X	X	X
Figure 53: Amount of colours available is (inadequate – adequate)	X	X	X
Figure 56: The information from the manual is easily understood (never – always)	X		
Figure 59: Placement of help messages on the screen is (confusing – clear)	X	X	
Figure 60: Accessing help messages is (difficult – easy)	X	X	
Figure 65: System failures occur (frequently – seldom)		X	
Figure 66: The system warns me about potential problems (never – always)	X	X	X
Figure 69: The ability to undo operations is (inadequate – adequate)		X	
Figure 72: The speed of setting up (installing) the software was (slow – fast)		X	X
Figure 73: I get informed of the installation progress (never – always)	X	X	X
Figure 74: The installation gives meaningful explanation when failures occur (never – always)	X	X	X

2. USABILITY OF PEP

2.1. Category 1: Overall reaction to the C3-Cloud system

Test users were asked for their overall reactions to the PEP along six different impressions. Figure 75 shows the mean ratings of 25 users to the impressions on a scale from 0-9.

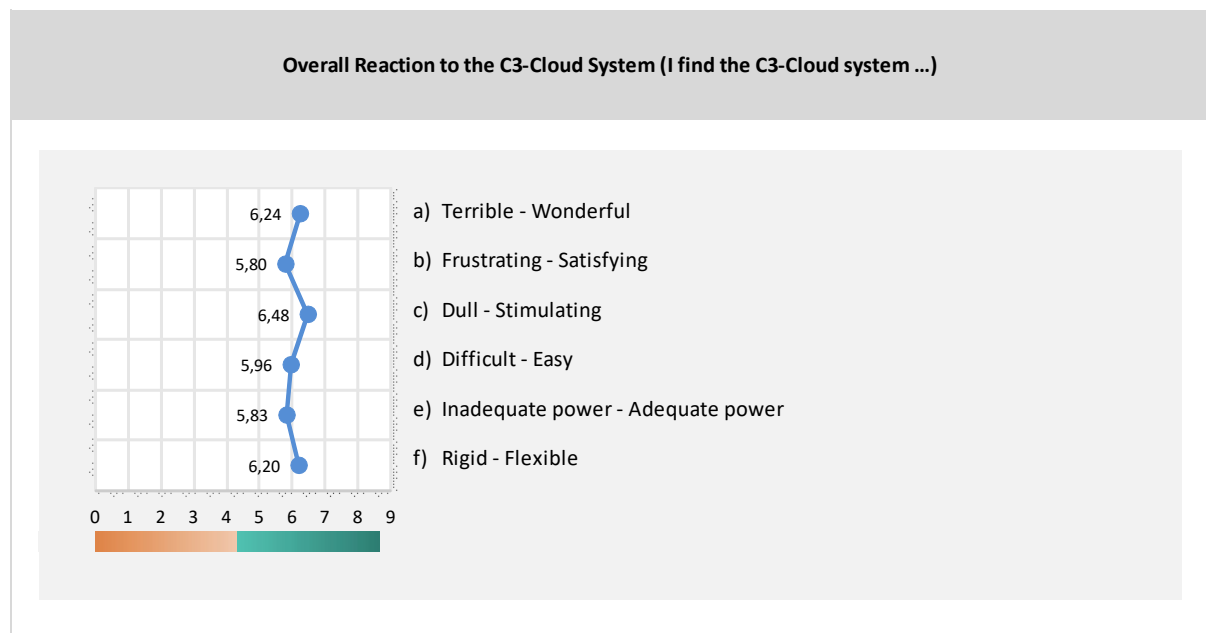


Figure 75: Overall Reaction to the C3-Cloud System (I find the C3-Cloud system ...)

When asked to rate the system from “terrible” to “wonderful” (see (a) in Figure 21 above), the PEP is rated an average of 6.2 with a standard deviation of 1.5. While almost all respondents (92%) rated the PEP rather positive (5 or higher), 8% rated it a 3 or 4 and 17% of all users did not answer the question.

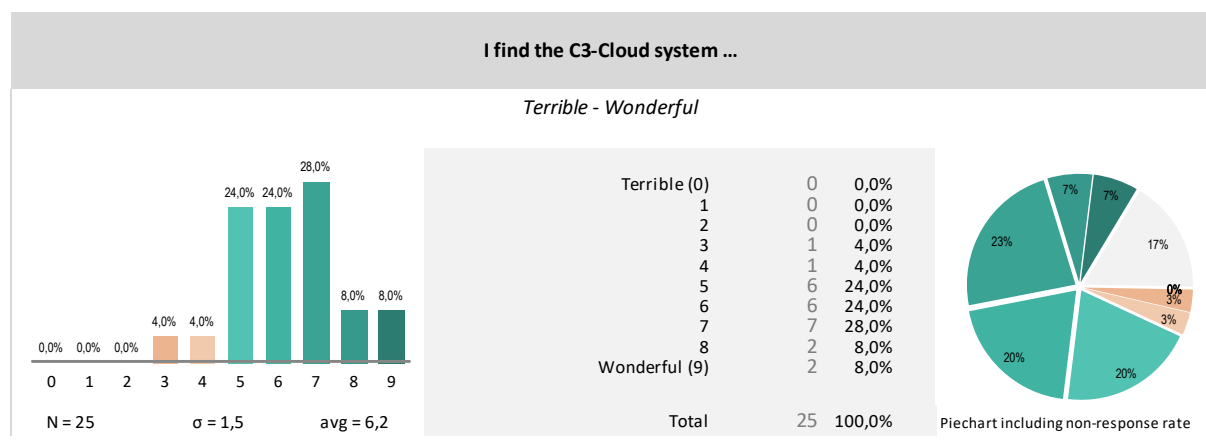


Figure 76: I find the C3-Cloud system (terrible – wonderful)

The results are not as clear in terms of if respondents are frustrated or satisfied with the system. With an average of 5.8 (STD=1.8) there would be room for further discussion of why some users found PEP frustrating (b).

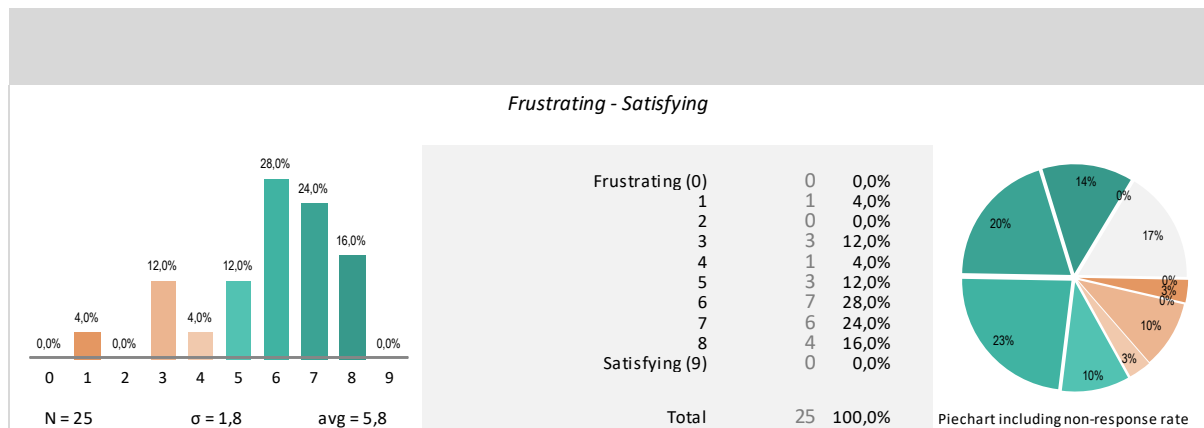


Figure 77: I find the C3-Cloud system (frustrating – satisfying)

An average of 6.5 with a 1.8 standard deviation captures the users' impression on the PEP as being rather stimulating than dull (c). The majority of users rated it a 7 (36%) or 8 (20%).

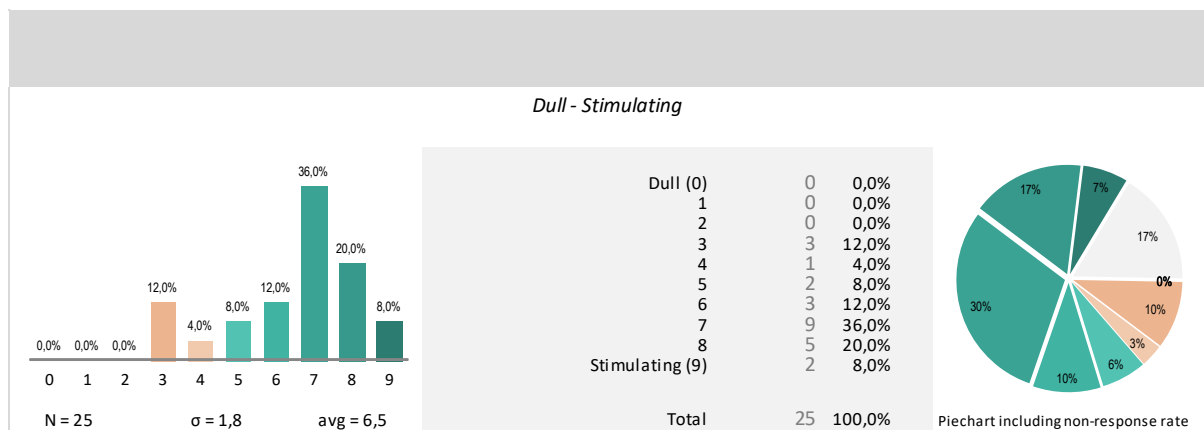


Figure 78: I find the C3-Cloud system (dull – stimulating)

Users experienced the PEP rather easy rather than difficult (d). However, a mean rating of 6 (STD=1.9) and 30% of all users rating it 4 and below or not responding at all, indicates that usage can also be experienced difficult ; exactly whet to be further investigated.

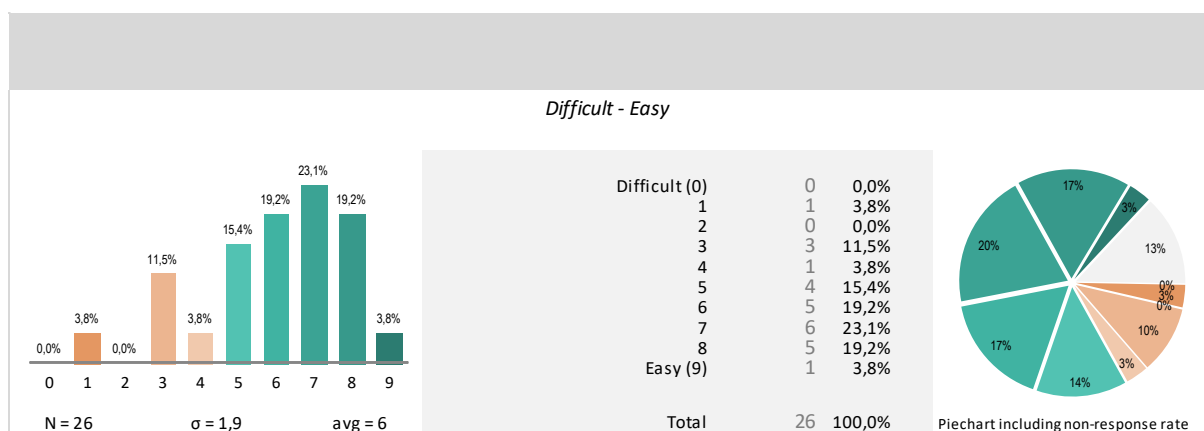


Figure 79: I find the C3-Cloud system (difficult – easy)

The 5.7 average (STD=1.7) on the next item shows that the users experience the power of PEP only playing in the mid-range and there is room for improvement: either on the power of the system, or by better empowering users making full use of functionalities that are already available.

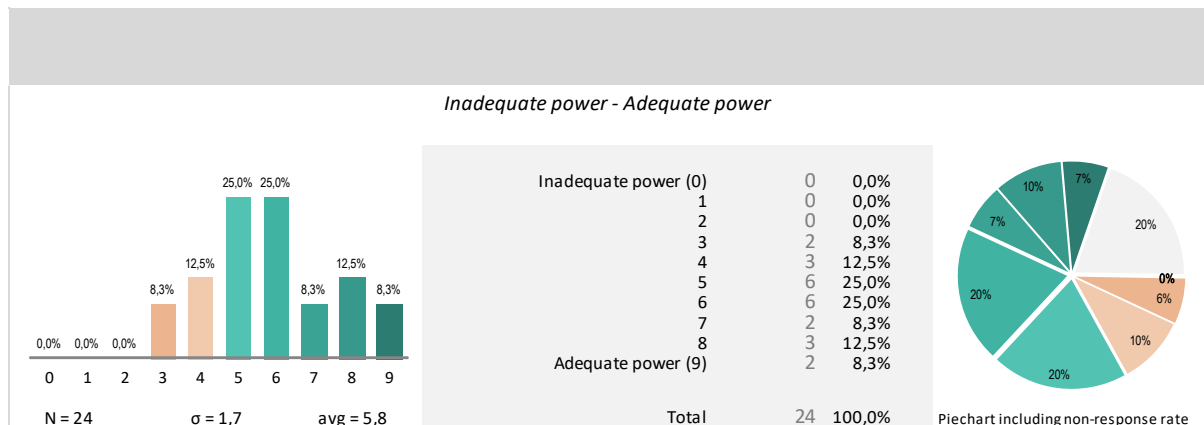


Figure 80: I find the C3-Cloud system (having inadequate power – having adequate power)

With an average of 6.2 (STD=1.5) users rated the PEP rather flexible rather than rigid (f).

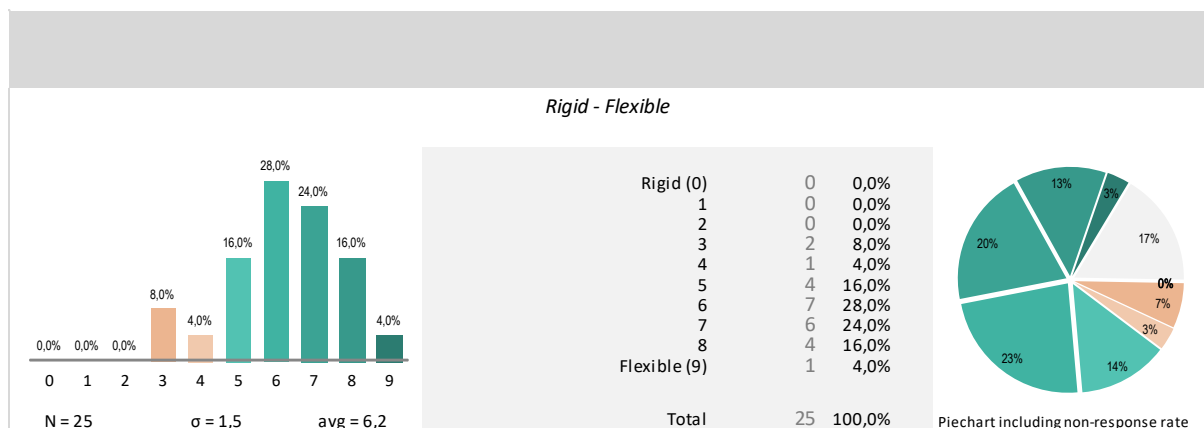


Figure 81: I find the C3-Cloud system (rigid – flexible)

2.2. Category 2: The screen

When asked to rate the system from “Hard to read”-“Easy to read” (a), the PEP was rated an average of 7.1 with a standard deviation of 2. The users mostly tended to read the characters on the screen easily. However, some users seemed to be of a different opinion by not rating it high. A few users also rated the characters as rather hard to read (4 or below).

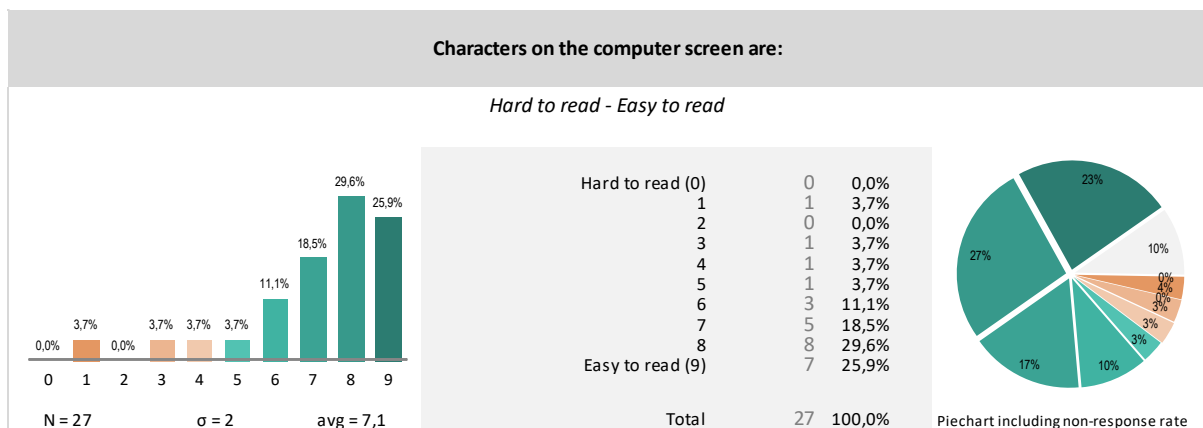


Figure 82: Characters on the computer screen are (hard to read – easy to read)

When asked to rate fuzziness and sharpness of the image of characters (b), the average is 6.9 with a rather large STD of 2.1. While 65% or respondents rated the sharpness of characters a 7 or higher, still 16% were not satisfied with it (rating it 4 or below).

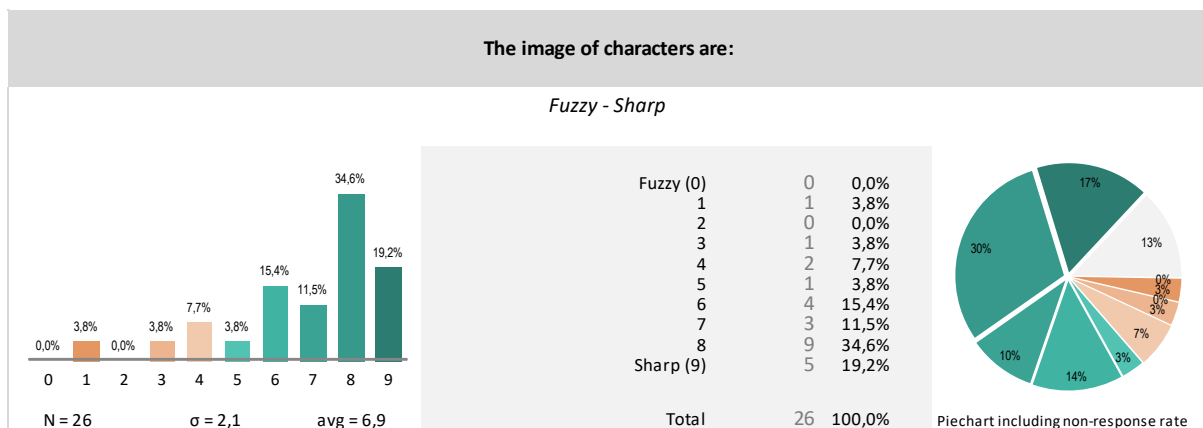


Figure 83: The image of characters are (fuzzy – sharp)

An average 6.4 with a STD of 2 is the perception of whether screen highlighting (c) is very helpful or not so much. 64% found it quite or very helpful (7 or higher) yet, 14% of respondents were not convinced and 27% of all users did not respond in the first place.

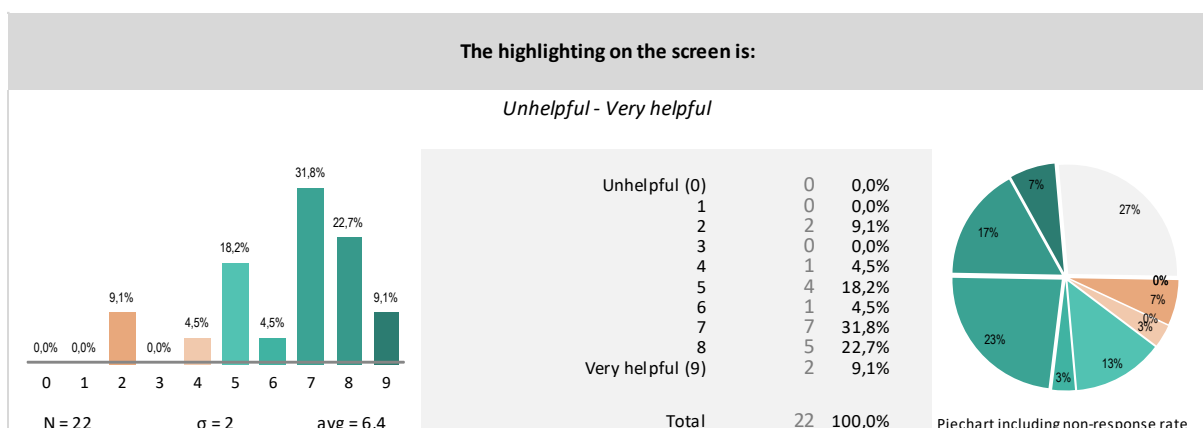


Figure 84: The highlighting on the screen is (unhelpful - very helpful)

When asked to rate the “Use of bolding” (d), the average is 6.5 (STD=1.7). Many users (48%) rated the use of bolding as being helpful. However, there seems to be room for improvement, as 40% rate bolding only averages (5 or 6) or below.

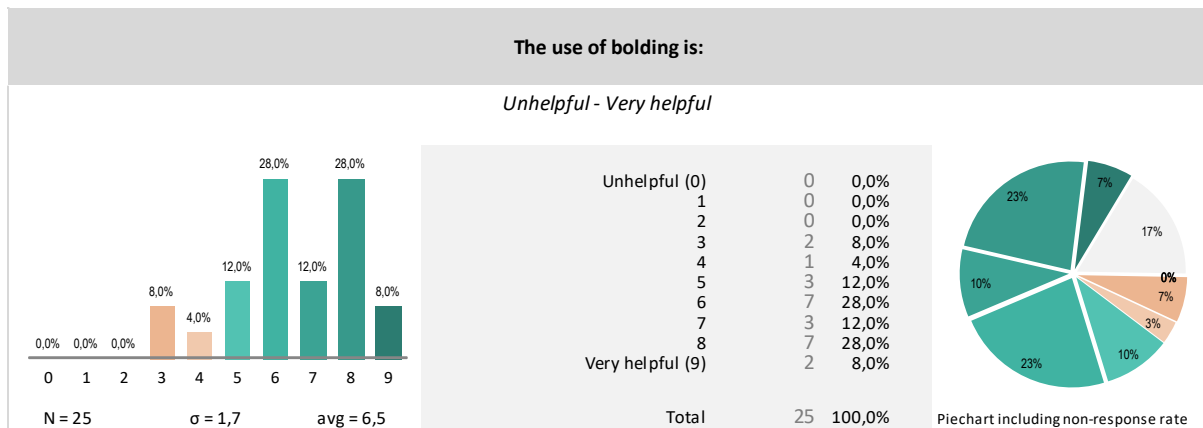


Figure 85: The use of bolding is (unhelpful - very helpful)

Users rated if screen layout (e) was “never” or “always” helpful. The mean of 5.9 (STD=2) indicate there may be room for improvement. 27% of respondent rate it a 5 and responses range from 2-9.

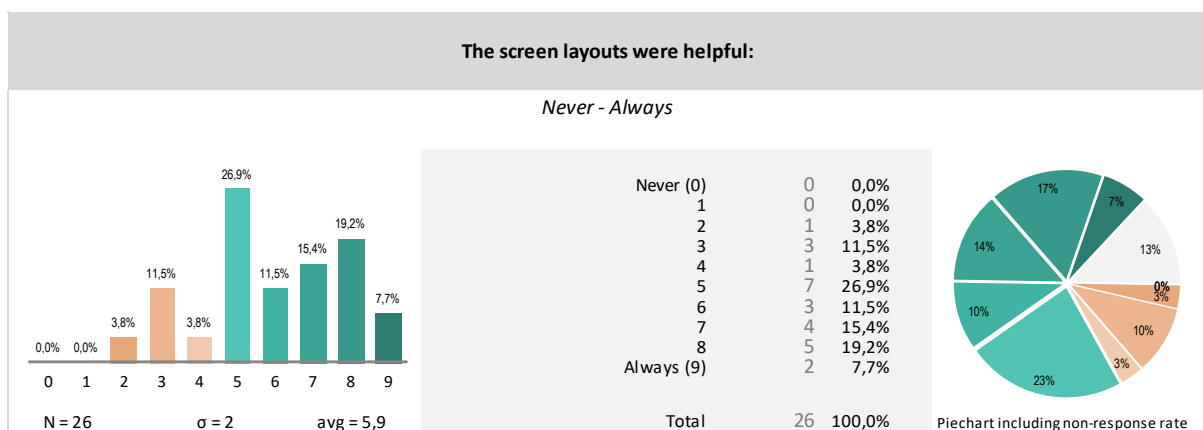


Figure 86: The screen layouts were helpful (never – always)

The amount of information that can be displayed on the screen (f) was perceived quite heterogeneously, with an average 6.3 and a quite large STD of 2.4 and a range from 0-9. It could be further investigated what information should be presented to patients and how this can best be done. Means to discuss this issue have already been implemented together with a clinical reference group in WP4, T4.1.

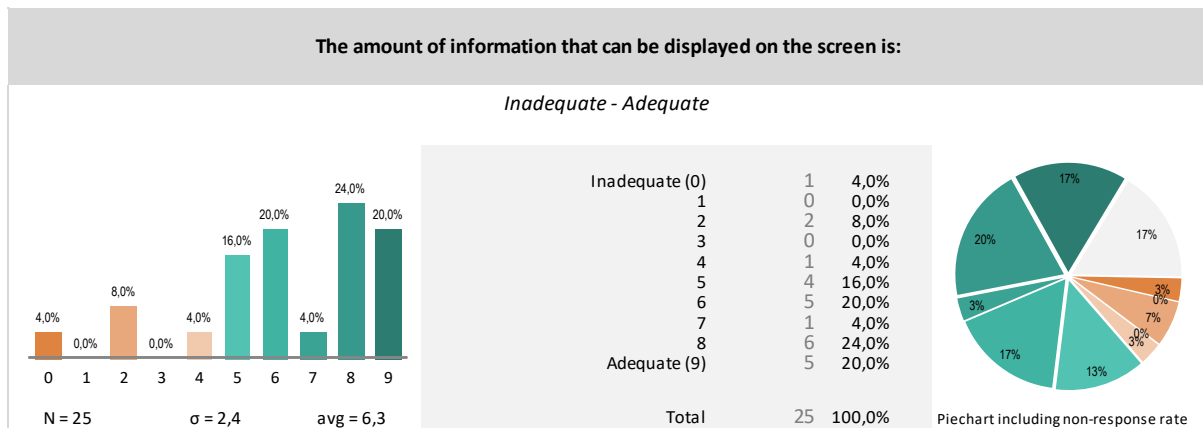


Figure 87: The amount of information that can be displayed on the screen is (inadequate – adequate)

The arrangement of information on the screen (g) is perceived quite dispersed (ranging from 1-9 with a STD=2.1). With an average rating of 5.9 many users found the arrangement of information rather logical, but there may be room for improvement.

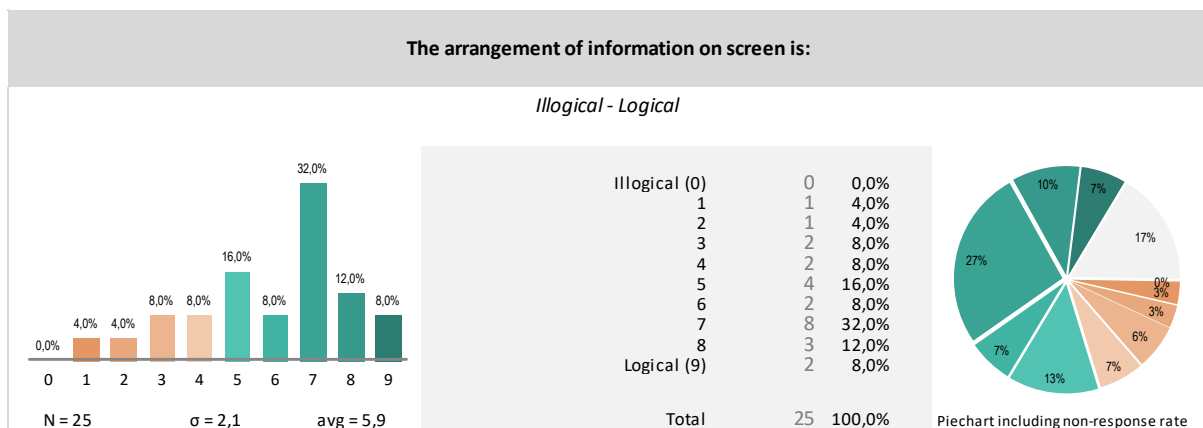


Figure 88: The arrangement of information on screen is (illogical – logical)

The sequence of screens (h) is rated a mean of 5.8 (STD=2.3), ranging from 1 (confusing) to 9 (clear). The spread of ratings across the scale indicates that the sequence is perceived clear for some, but other users found it rather confusing and it could be discussed what can be done to make it clearer.

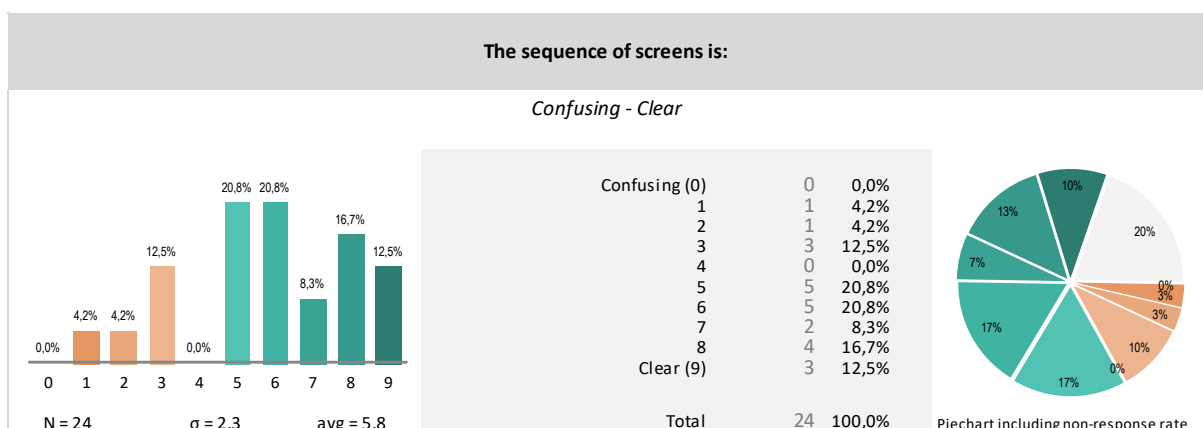


Figure 89: The sequence of screens is (confusing – clear)

A similar picture is for the predictability of the next screen in a sequence (i). User ratings range from 1-9 with a mean of 5.5 and a STD of 2.4.

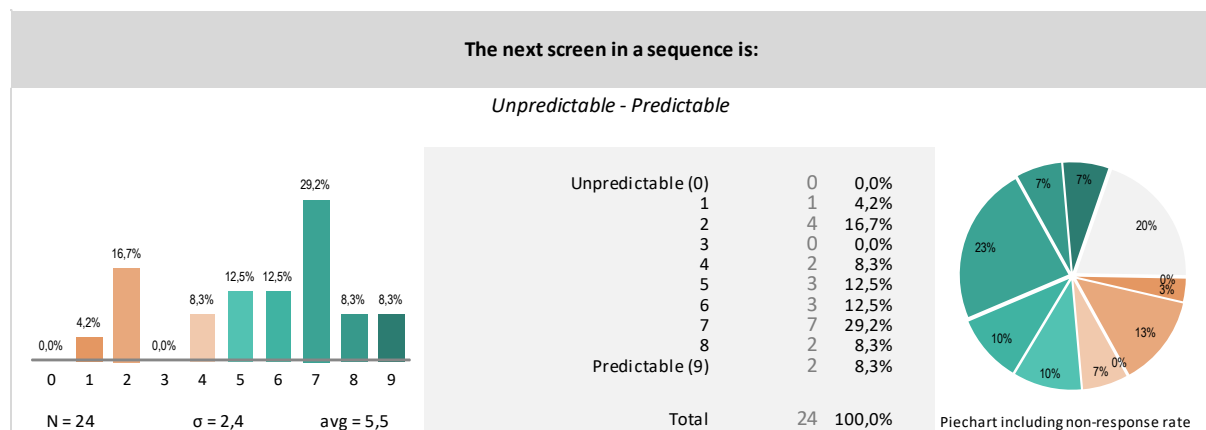


Figure 90: The next screen in a sequence is (unpredictable – predictable)

When asked to rate whether “going back to the previous screen” is “Impossible” or “Easy” (j), the average is 6.8 with a STD of 1.8. 65% of responses rate the item a 7 or higher with only 12% of responses indicating a rather conservative evaluation (3 and 4).

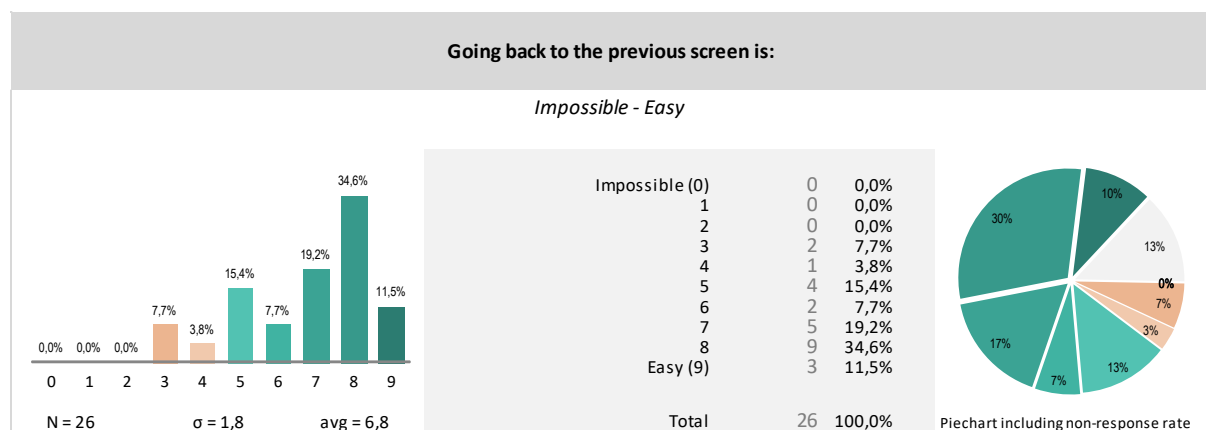


Figure 91: Going back to the previous screen is (impossible – easy)

The clarity in the progression of work-related tasks (k) was rated quite differently. An average of 5.4 and a standard deviation of 2.4 gives room for further investigations. Even more so since ratings range from 1-9.

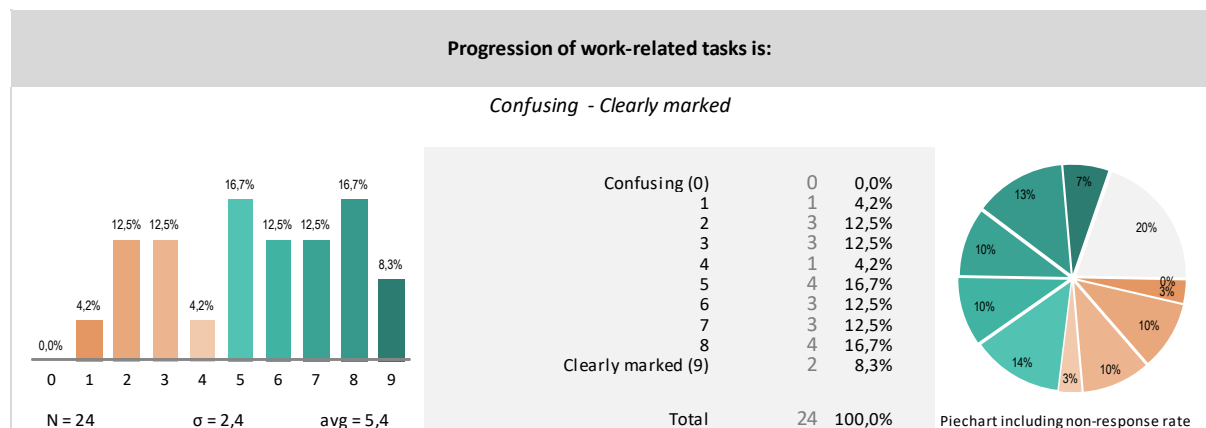


Figure 92: Progression of work-related tasks is (confusing – clearly marked)

2.3. Category 3: Terminology and system information

When asked to rate whether “The use of terminology throughout the system” is “Consistent” or “Inconsistent” (a), the average is 5.8 with a standard deviation of 2.1. 50% of users rated this feature between 3-6, indicating that the consistency of terminology used in the PEP can still be improved. However, a 37% non-response rate indicates that some users may not have been able to answer this question.

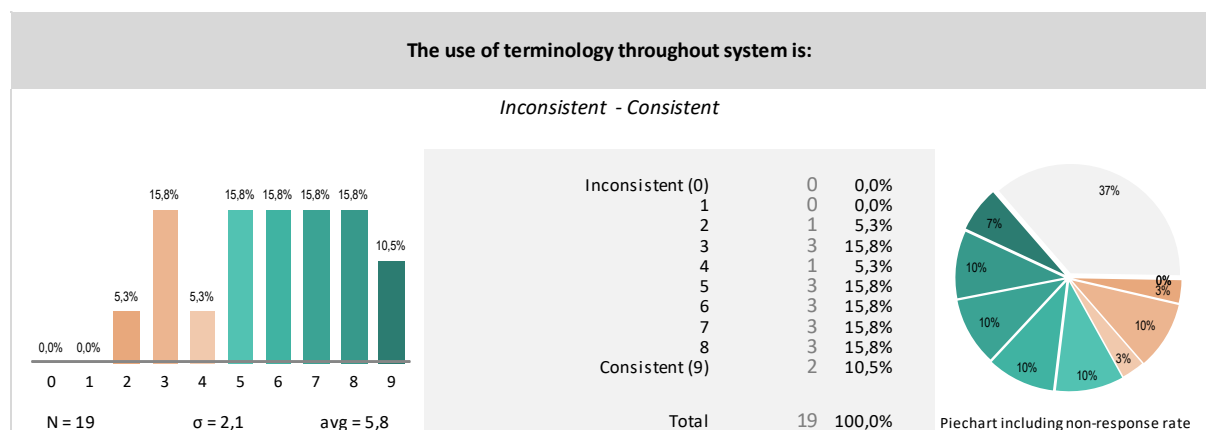


Figure 93: The use of terminology throughout system is (inconsistent – consistent)

Regarding the consistency and inconsistency of “work related terminology” (b), ratings range from 2-9 with 60% rating it 6 or below. The mean of 5.6 (STD=2.2) indicates that users rate work-related terminology is perceived rather inconsistent than consistent. However, a 36% non-response rate indicates that some users may not have been able to answer this question, perhaps due to confusion about the questions phrasing (“work-related”). This should be improved in the QUIS7 questionnaire handed out to users during the technology trial.

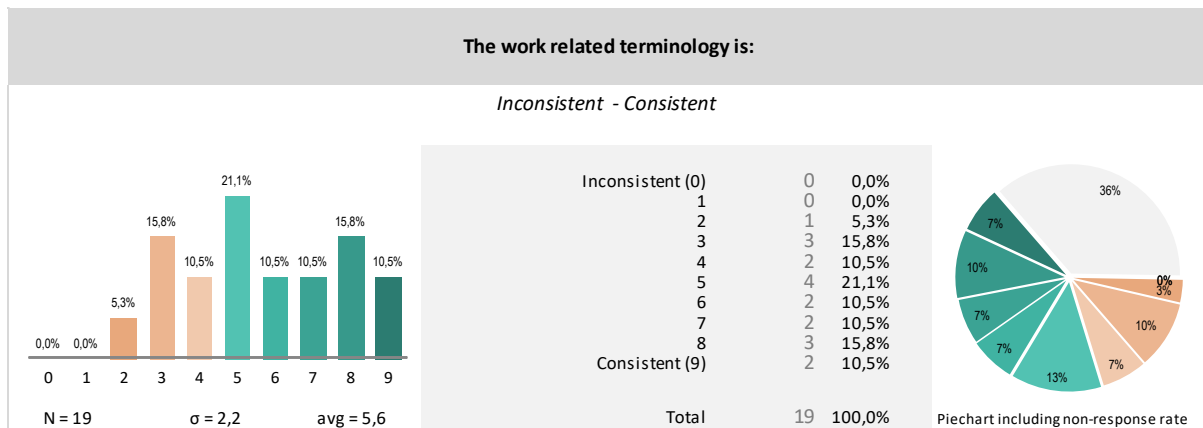


Figure 94: The work related terminology is (inconsistent – consistent)

Similarly to the above, test users rated the consistency and inconsistency of “computer terminology” (c) with an average 5.8 and a STD of 2.1. However, a 40% non-response rate indicates that some users may not have been able to answer this question.

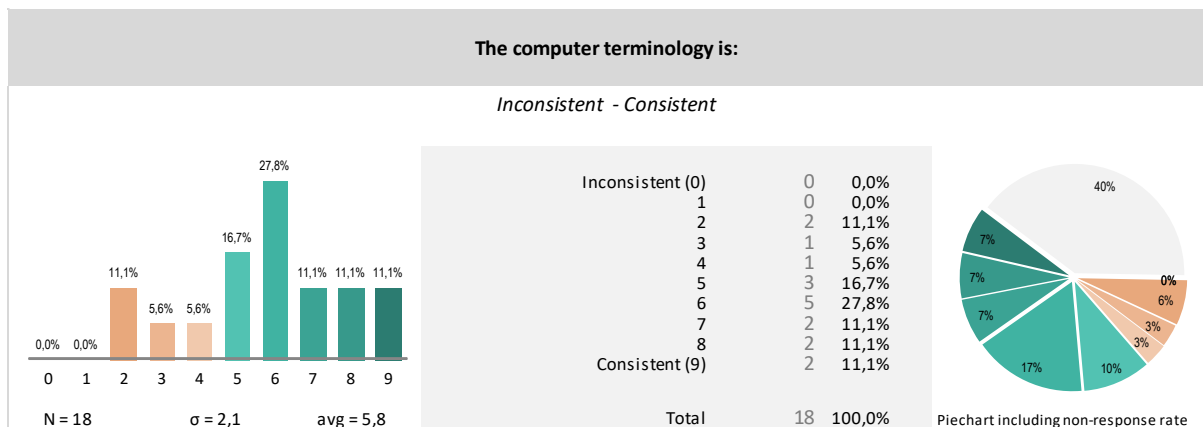


Figure 95: The computer terminology is (inconsistent – consistent)

The rating of whether “the terminology relates well to the activities of the user” (d) ranged from 2-9, with a mean of 6 and a STD of 1.8 peaking at 7 (31% of users). 40% rated the item a 5 or below, which gives room for further discussions.

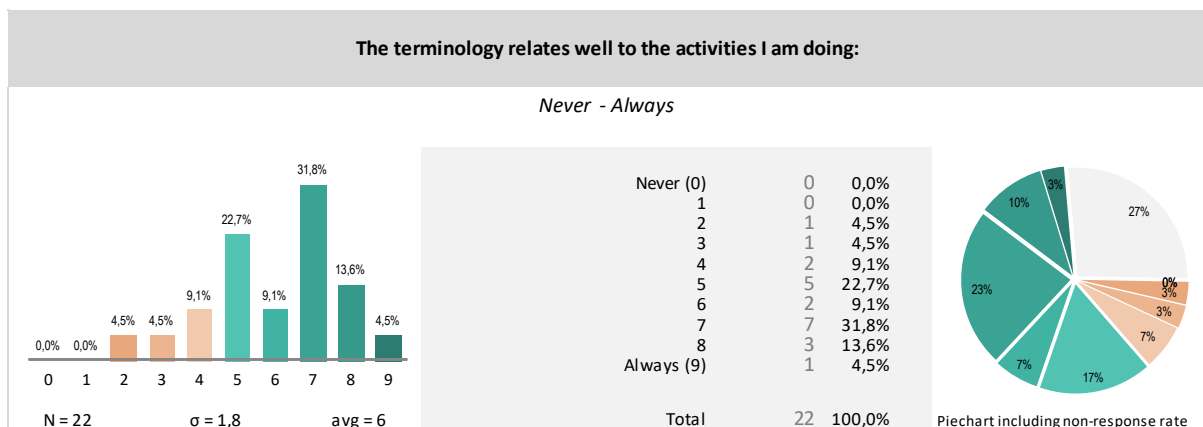


Figure 96: The terminology relates well to the activities I am doing (never – always)

When asked to rate if the frequency of computer terminology usage is appropriate or too frequent (e), there is a disperse picture. The average is 5.6 with a STD of 2.4 and 27% of all users did not respond. 45 % of respondents rated the item a 5 or lower.

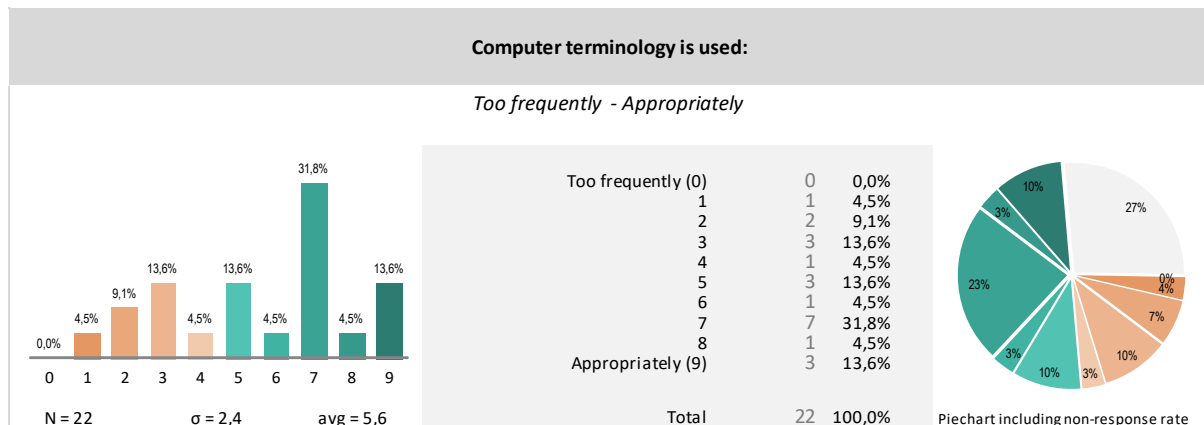


Figure 97: Computer terminology is used (too frequently – appropriately)

Respondents rated whether the “Terminology on the screen is” “Ambiguous” or “Precise” (f) with a mean of 5.9 and a STD of 1.8 (27% non-response rate). 59% of respondents rated screen terminology in the middle of ambiguous and precise (3-6). However, the remaining 41% range 7 or above, indicating that some users still find screen terminology precise.

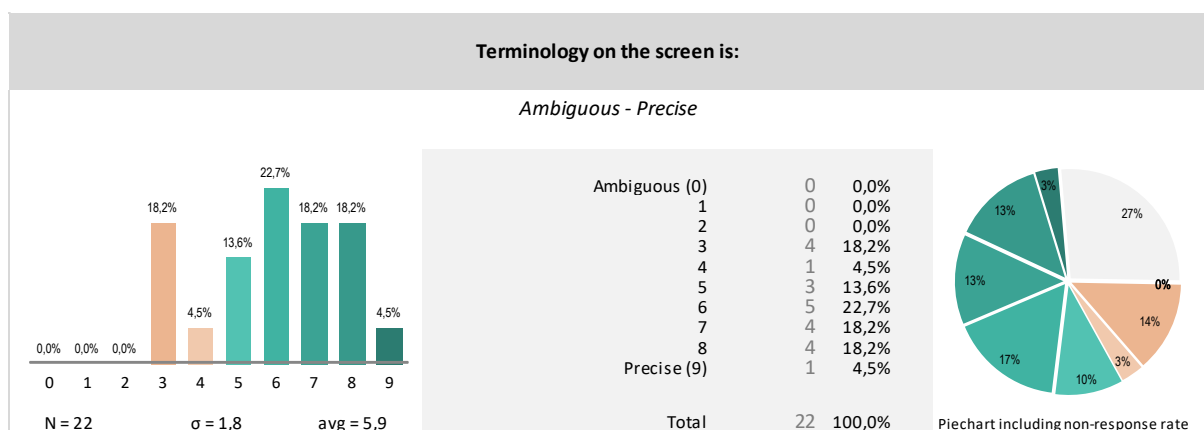


Figure 98: Terminology on the screen is (ambiguous – precise)

“Messsages that appear on the screen” (g) are rated rather consistent rather than inconsistent, with a mean of 6.4. However, the STD of 2.1 indicated that the rating is rather heterogeneous, which is also reflected by the range of 2-9 and 27% non-response rate. Screen messages could thus be further investigated.

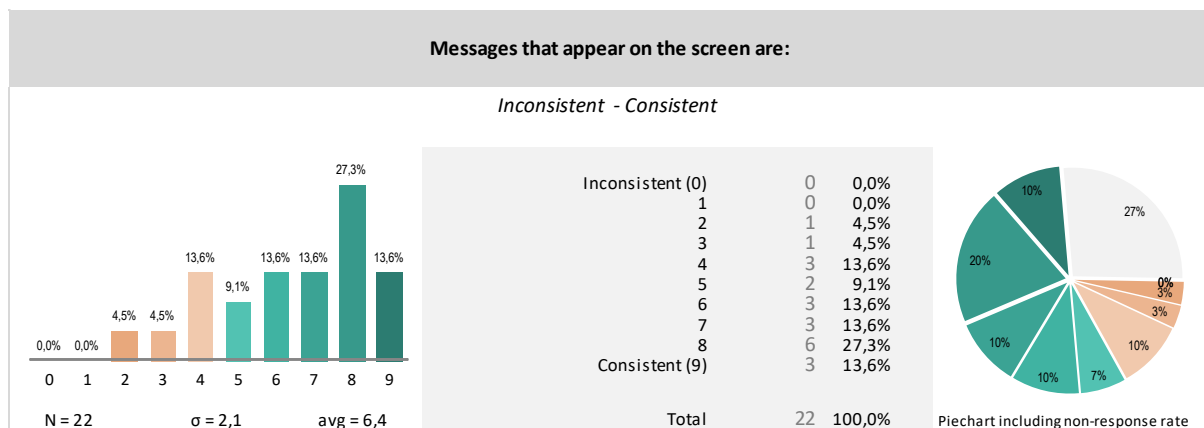


Figure 99: Messages that appear on the screen are (inconsistent – consistent)

When asked to rate whether “the position of the instructions on the screen” is “Consistent” or “Inconsistent” (h), the average is 6.2 with a standard deviation of 2.1. 48% of respondents evaluated the positioning quite consistent, while 32% experienced inconsistencies (rating the item 5 or below).

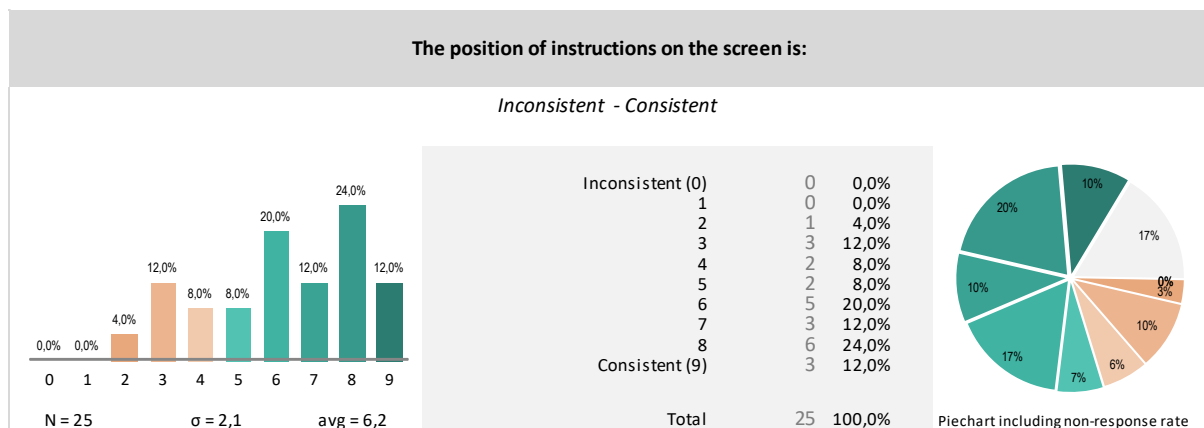


Figure 100: The position of instructions on the screen is (inconsistent – consistent)

“Messages that appear on the screen” (i) were rated clear rather than confusing, with a mean of 6.3 (STD=2.1).

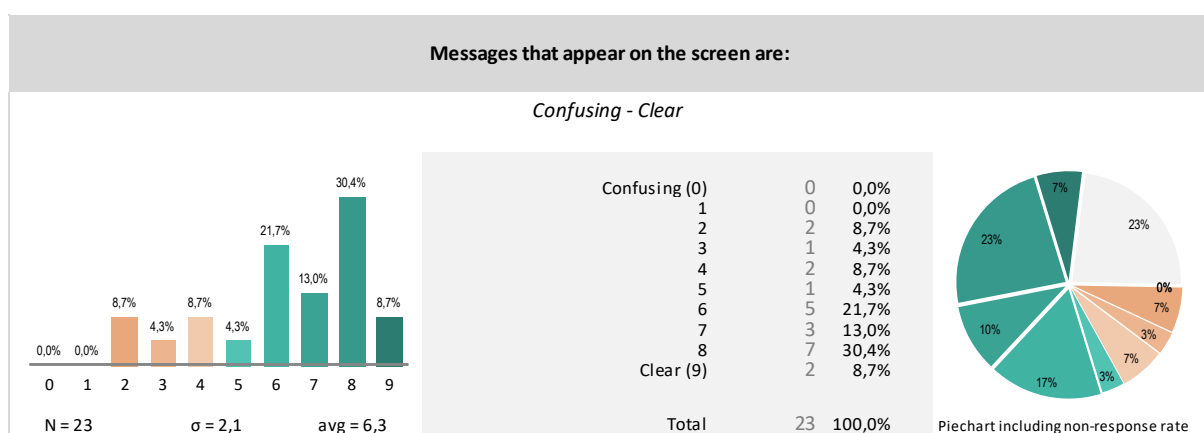


Figure 101: Messages that appear on the screen are (confusing – clear)

A rather heterogeneous rating was given on whether instructions for command were confusing or clear (mean of 5.8; STD=2). 35% of respondents rate this item a 7 or higher, yet the majority (65%) rate is 6 or below, 20% giving only a rating of 2 or 3.

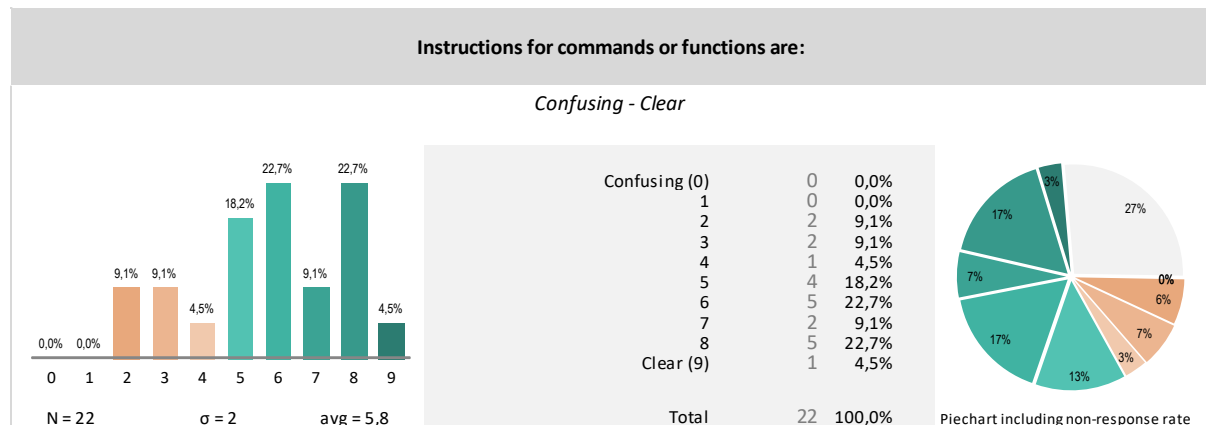


Figure 102: Instructions for commands or functions are (confusing – clear)

Instructions for correcting errors were perceived clear rather than unclear, with room for improvements (mean of 6.2; STD=1.9). It could be further investigated why 50% of all users did not respond on this question.

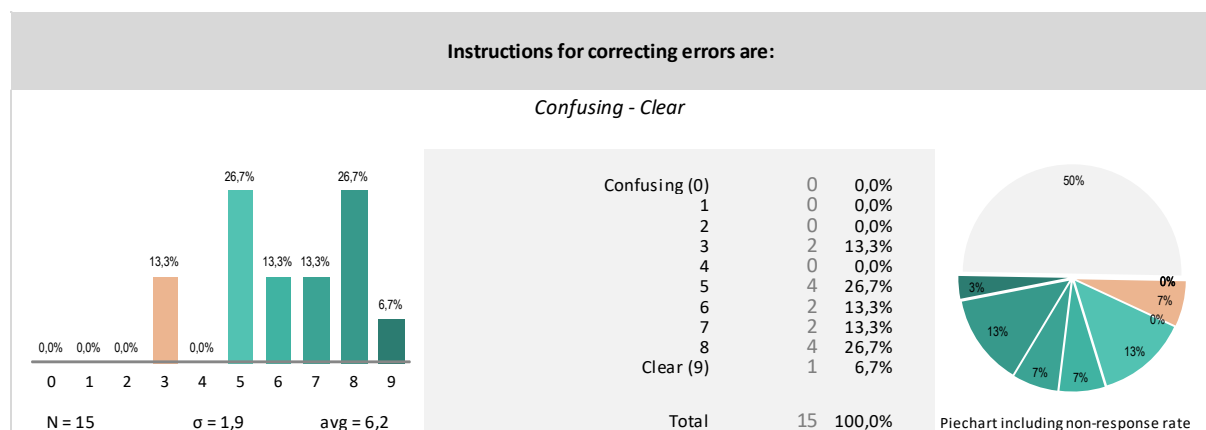


Figure 103: Instructions for correcting errors are (confusing – clear)

A quite dispersed rating was given on whether the computer never or always keeps the user informed about what it is doing. The average of 5.3 (STD=2.3) suggests that it is often unclear to some users what the computer is currently doing.

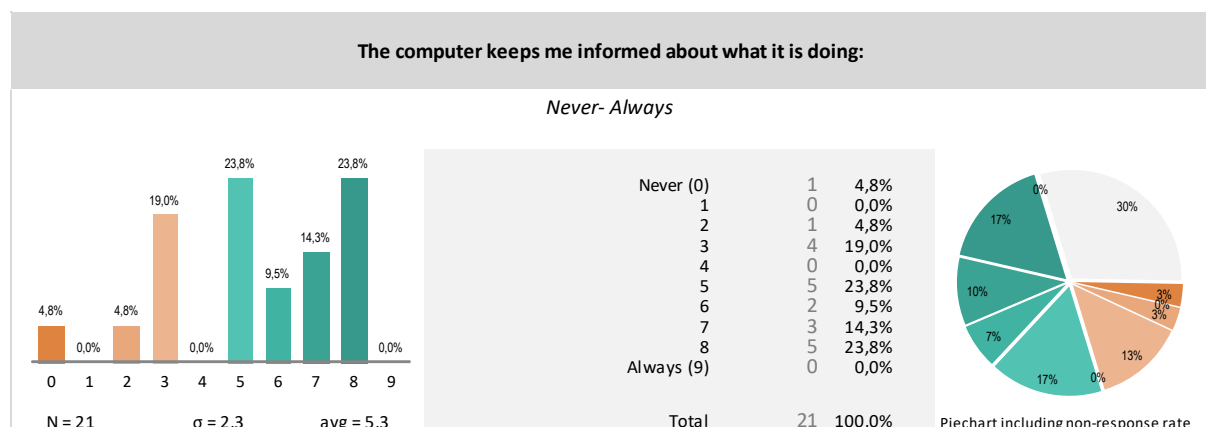


Figure 104: The computer keeps me informed about what it is doing (never – always)

A quite dispersed rating was given on whether animated cursors never or always keep the user informed about what it is doing. The average of 5.6 (STD=2.4) suggesting that it is often unclear to some users what the computer is currently doing.

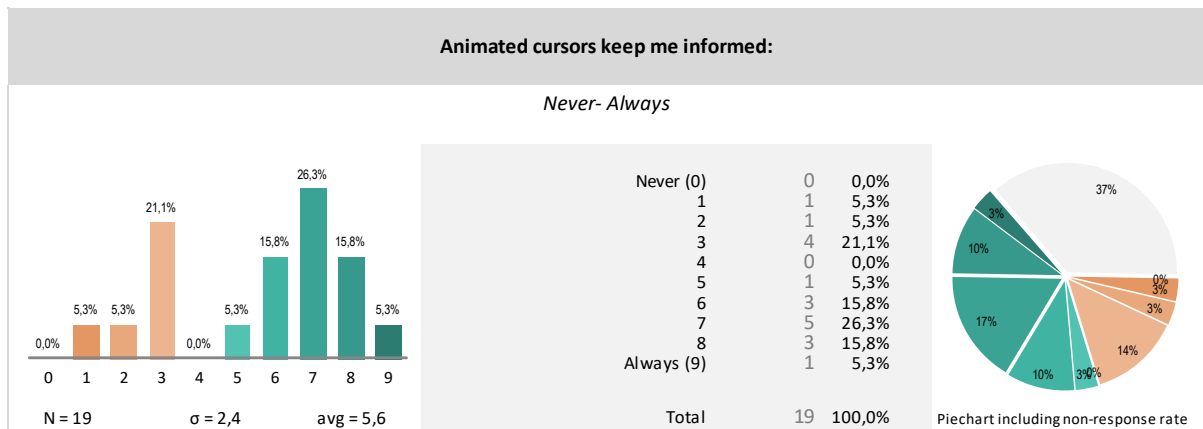


Figure 105: Animated cursors keep me informed (never – always)

“Performing an operation leads to a predictable result” (n) was rated an average of 6.3 (STD=2). Generally, users have a positive view on the predictability of PEP operations. However, 25% of respondents rated the item 4 or below.

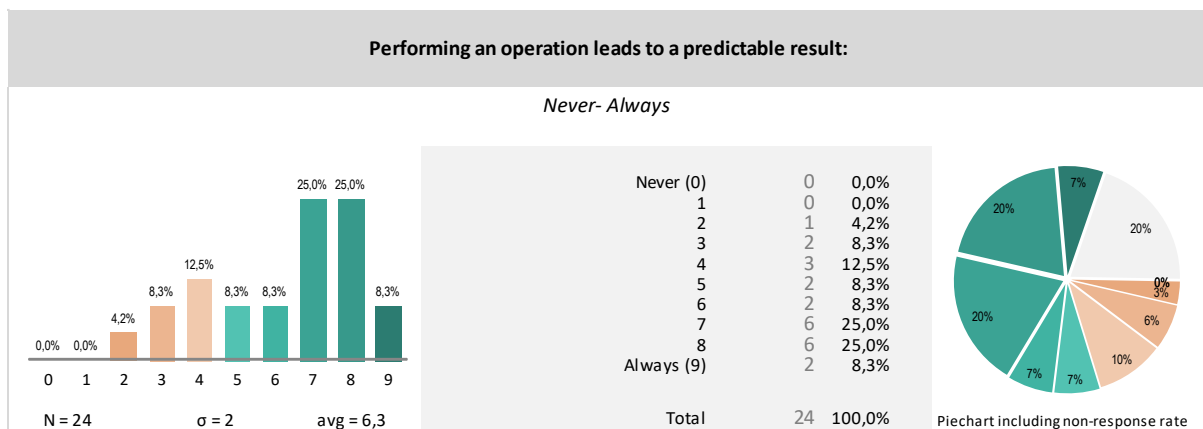


Figure 106: Performing an operation leads to a predictable result (never – always)

Regarding the easiness to “Controlling the amount of feedback” (o), ratings mostly ranged from 1-9, with an average of 6.4 and a STD of 2.4, while 40% of all users did not respond. Users found it easy rather than impossible to control the amount of feedback given.

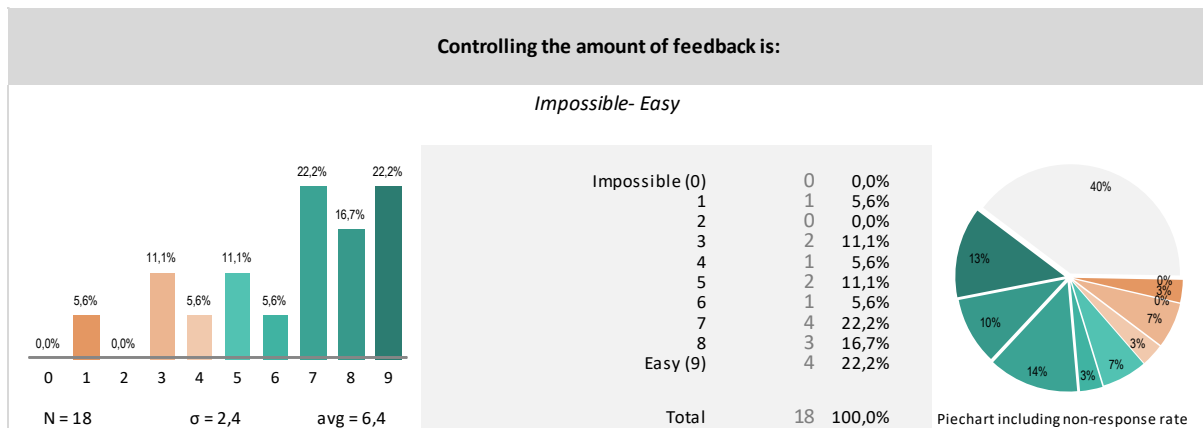


Figure 107: Controlling the amount of feedback is (impossible – easy)

When asked to rate whether “The length of delay between operations” is “Unacceptable” or “Acceptable” (p), the average is 7.4 with a standard deviation of 1.7. 67% of users rated this feature 8 or 9. The delay between operations seems being perceived as quite acceptable.

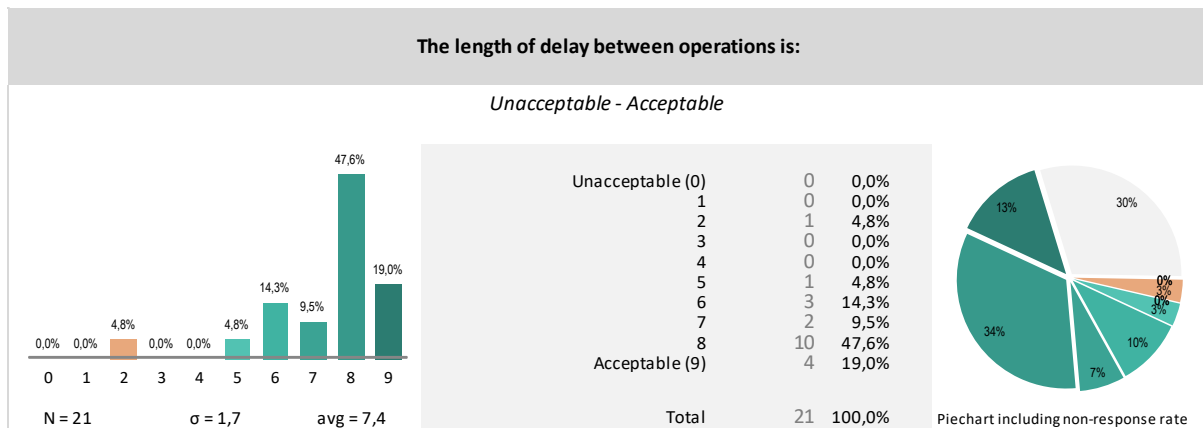


Figure 108: The length of delay between operations is (unacceptable – acceptable)

The rating of “Error messages” (q) being unhelpful or helpful has not been answered by 53% of all users. However, 50% of responders rated error messages being rather helpful (7 or above), resulting in a mean of 6.5 (STD=1.9). It could be checked if no error message occurred, resulting in users not responding to this item.

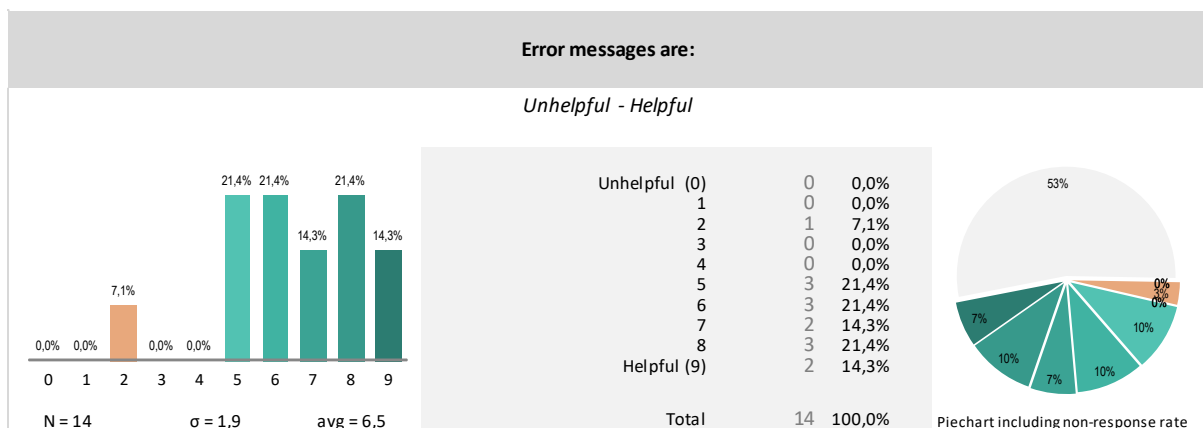


Figure 109: Error messages are (unhelpful – helpful)

When respondents rated the problem-resolving capability of error messages, they found them helpful most of the time (60% of respondents rating it 7 or 8 with a mean of 6.3 and a STD=2.1). Yet, 60% of all users did not respond and 33% of respondents seemed not convinced error messages always clarify the issue.

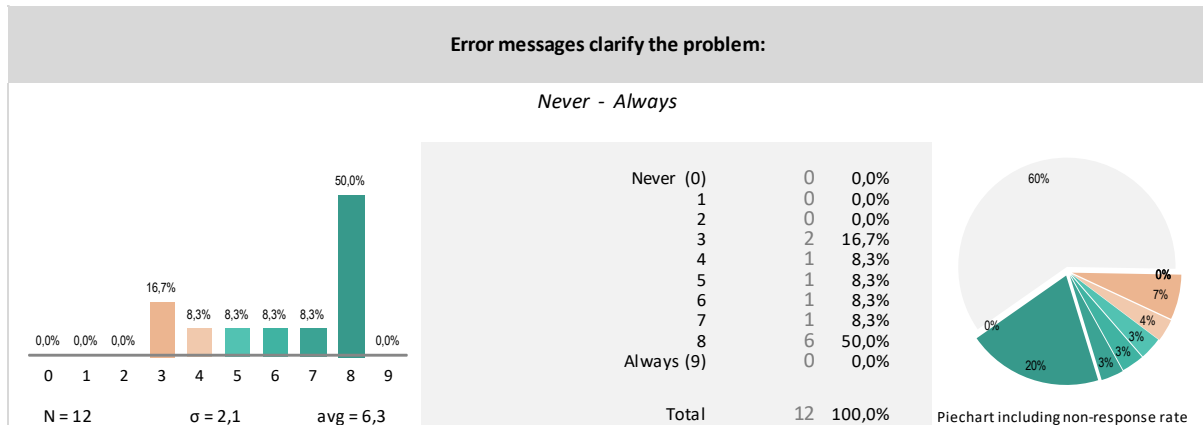


Figure 110: Error messages clarify the problem (never – always)

The “Phrasing of error messages” is rated pleasant rather than unpleasant with a mean rating of 6.1 (STD=2.2). Yet, 25% of users rated between 2-4 and 60% of all users did not respond.

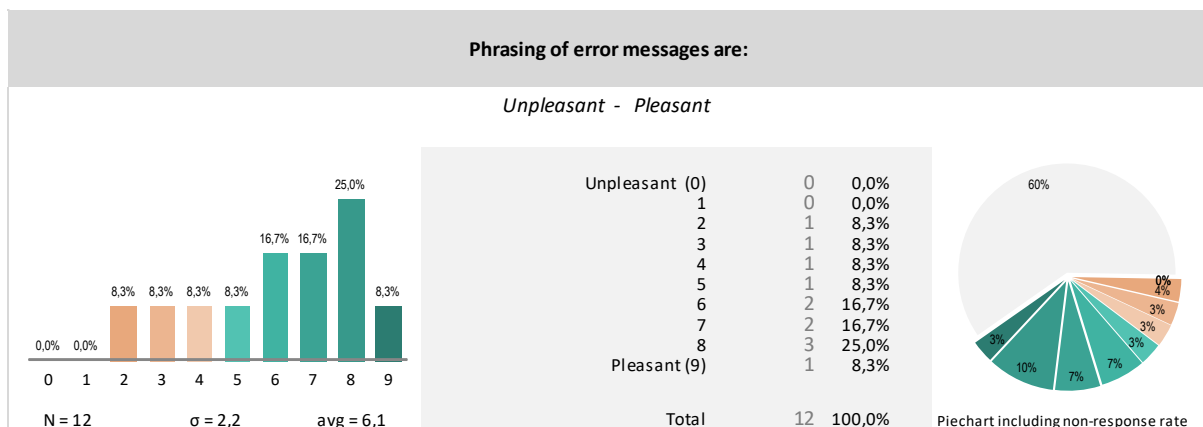


Figure 111: Phrasing of error messages are (unpleasant – pleasant)

2.4. Category 4: Learning

When asked to rate whether “Learning to operate the system is “Difficult” or “Easy” (a), users rated this item an average of 6.4 (STD=2.1). 25% of respondents rated it 9 while 21% of respondents rated this feature 3 or 4. 20% of all users did not respond to this item.

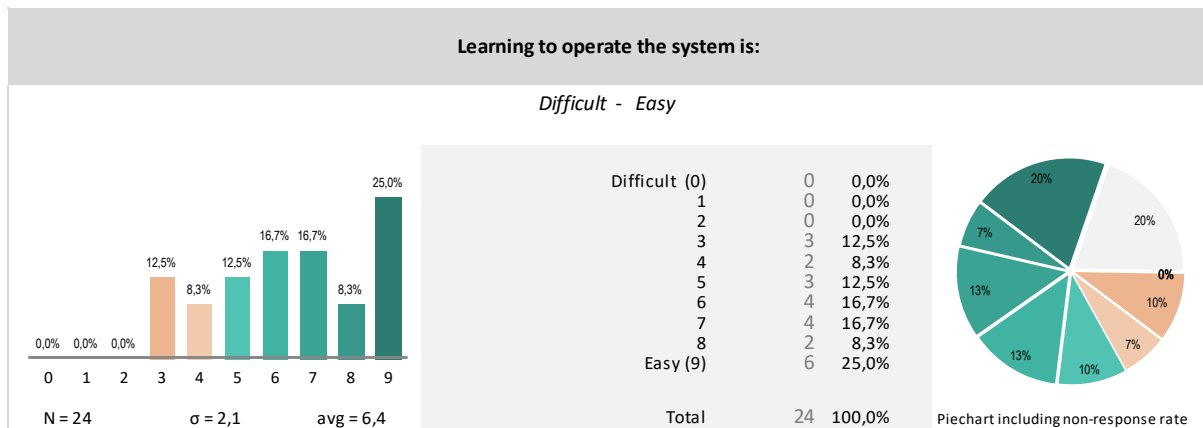


Figure 112: Learning to operate the system is (difficult – easy)

“Getting started” (b) was rated an average of 6.3 (STD=2.2) and with 33% of respondents rating the item 8-9, it seems being perceived as rather easy. However, there seems to be room for improvement as 16% rated the item only 2-3.

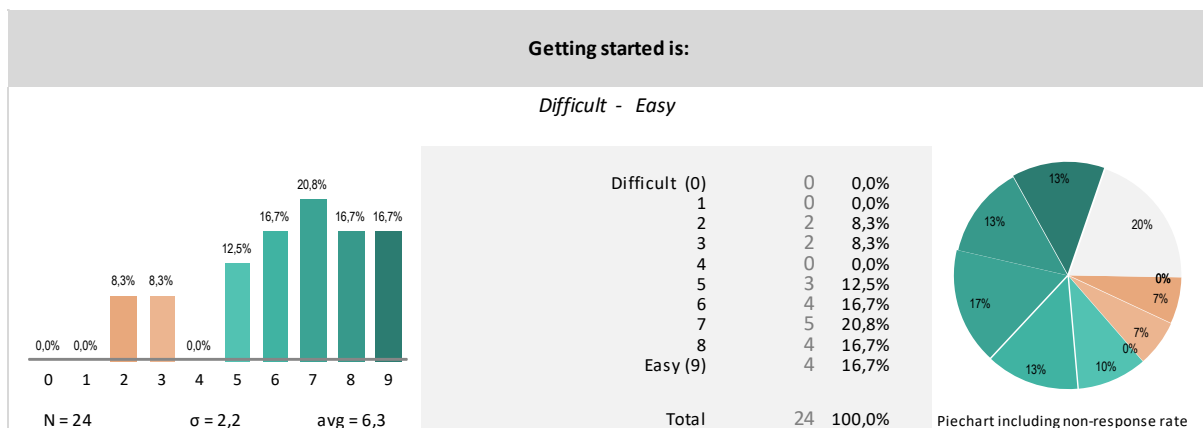


Figure 113: Getting started is (difficult – easy)

“Time to learn to use the system is” (c) was rated with an average of 6.7 (STD=2.1), thus somewhere in the upper middle between “slow” and “fast”. 39% of respondents rated learning being fast (8 and 9).

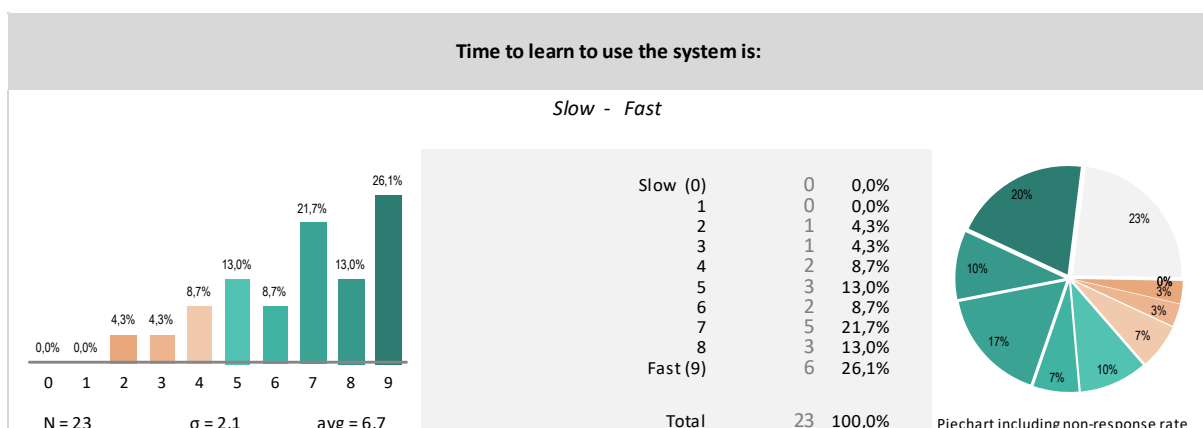


Figure 114: Time to learn to use the system is (slow – fast)

When asked to rate whether “Exploration of features by trial and error” (d), the average rating is 6.3 (STD=1.7). With 50% of respondents rating it 7 and above, the trend is towards feeling encouraged to explore more features. However, this could be triggered by the test-setting in which the questionnaire was answered and that users were naturally keen on exploring the features.

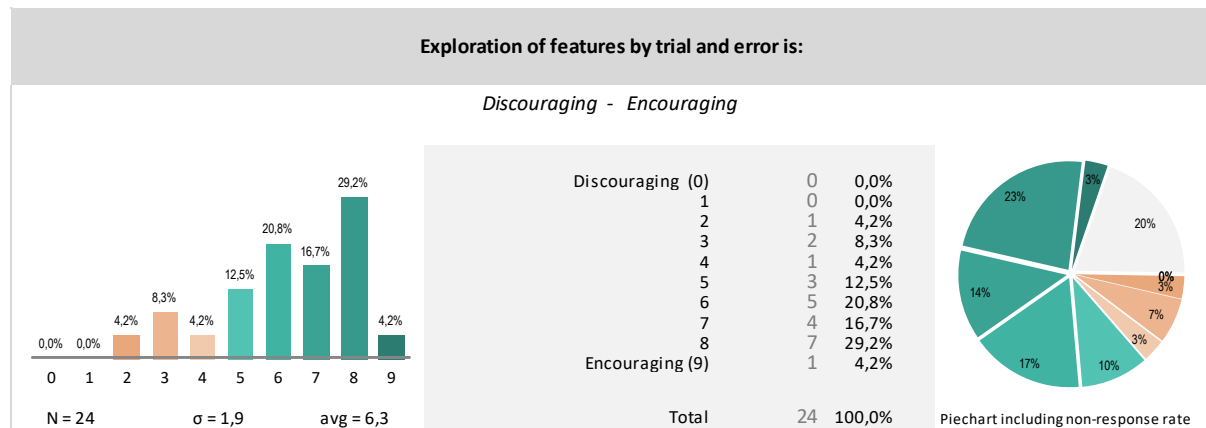


Figure 115: Exploration of features by trial and error is (discouraging – encouraging)

When asked to rate whether the “Number of steps per task” are “Too many” or “Just right” (e) the PEP scored quite well with an average is 6.9 and a STD of 1.8. 30% of all users gave no response to this item.

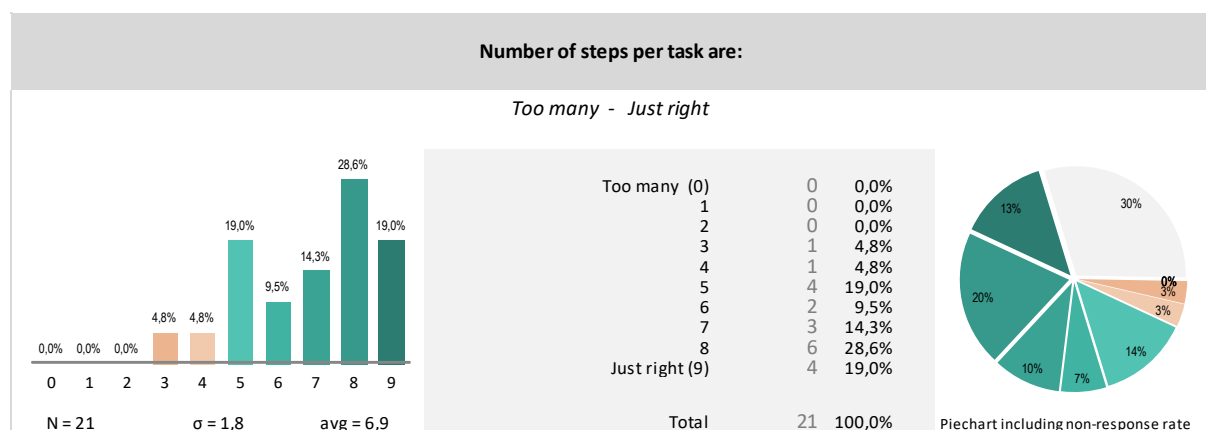


Figure 116: Number of steps per task are (too many – just right)

“Feedback on the completion of a sequence of steps” (f) is rated with an average of 6.6 (STD=2). 43% of all users did not respond to this item and 17% of all users rated feedback on the completion of a sequence of steps as rather unclear (rating it 5 or below). It could be clarified why this stands out against 33% of all users giving a rating of 7-9

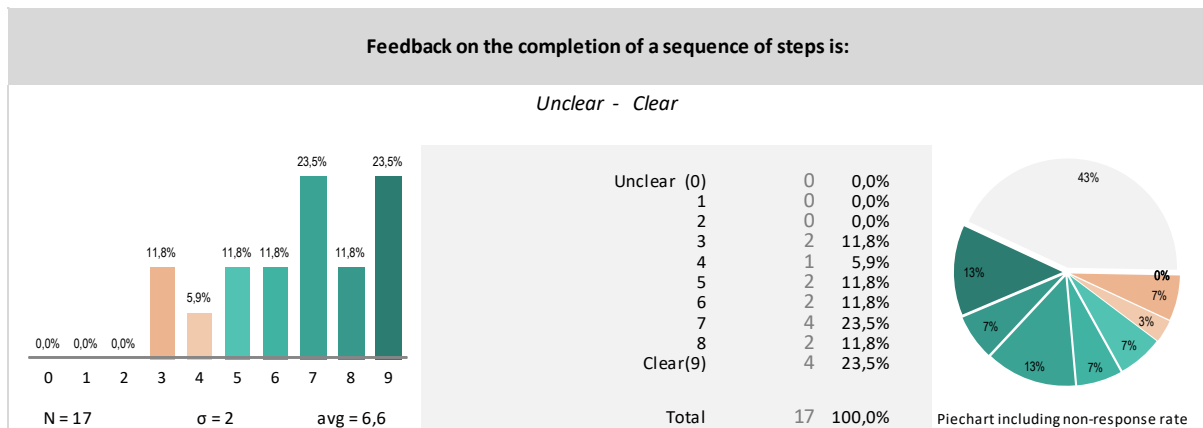


Figure 117: Feedback on the completion of a sequence of steps is (unclear – clear)

2.5. Category 5: Multimedia

Users rated the “Quality of still pictures/photographs” (a) with an average 6.8 and a STD of 1.5, suggesting that the quality is considered rather good. However, this item had a 37% non-response rate.



Figure 118: Quality of still pictures/photographs was (bad – good)

Users rated the fuzziness and clarity of “Pictures/Photos” (b) with an average of 6.6 and a STD of 1.8. However, this item had a 34% non-response rate.

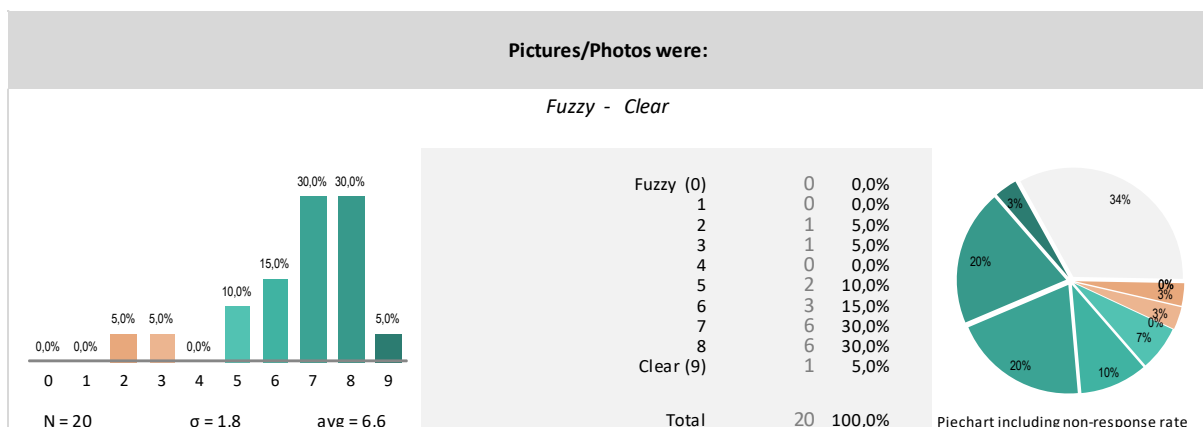
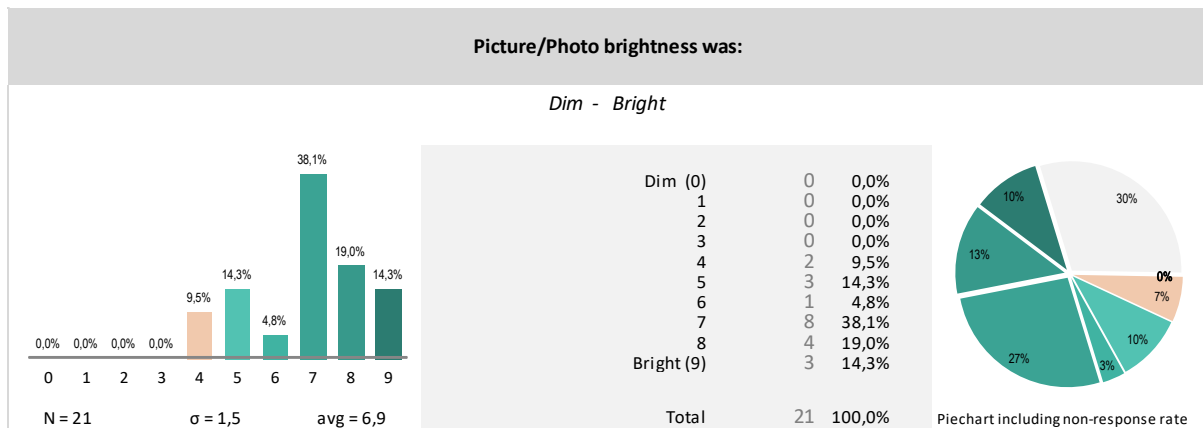
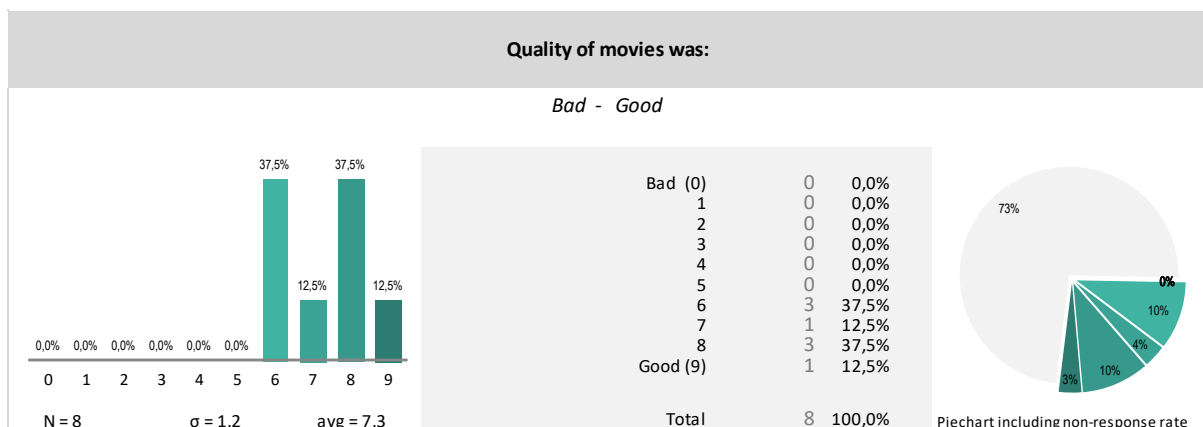


Figure 119: Pictures/Photos were (fuzzy – clear)

Regarding the dimness and brightness of the “Picture/Photo” (c), the average is 6.9 and the STD is 1.5. 71% of respondents rated the item 7, 8 and 9. This item had a 30% non-response rate.

**Figure 120: Picture/Photo brightness was (dim – bright)**

With a response rate of only 27%, the “Quality of movies” (d), was rated an average of 7.3 with a STD of 1.2. It is assumed that the rather low response-rate could be due to the fact that some users may have thought video quality referred only to the PEP platform as such and not so much to other material that was shown during the training (e.g. the C3-Cloud introduction video).

**Figure 121: Quality of movies was (bad – good)**

A rating similar to the above is repeated in the dimness and brightness of the “movie images” (e). A SDT of 1.2 was observed for the mean of 7.3. The response rate was again as low as 20%.

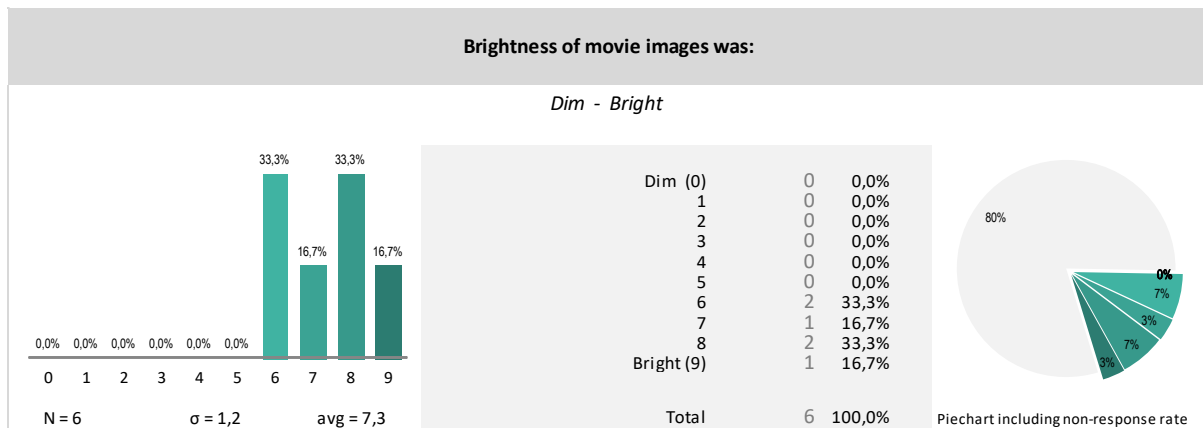


Figure 122: Brightness of movie images was (dim – bright)

The adequacy of “Movie window size” (f) is rated similar to the above. The average rating is 7.2 with a STD of 1.2. The response rate was as low as 20%.

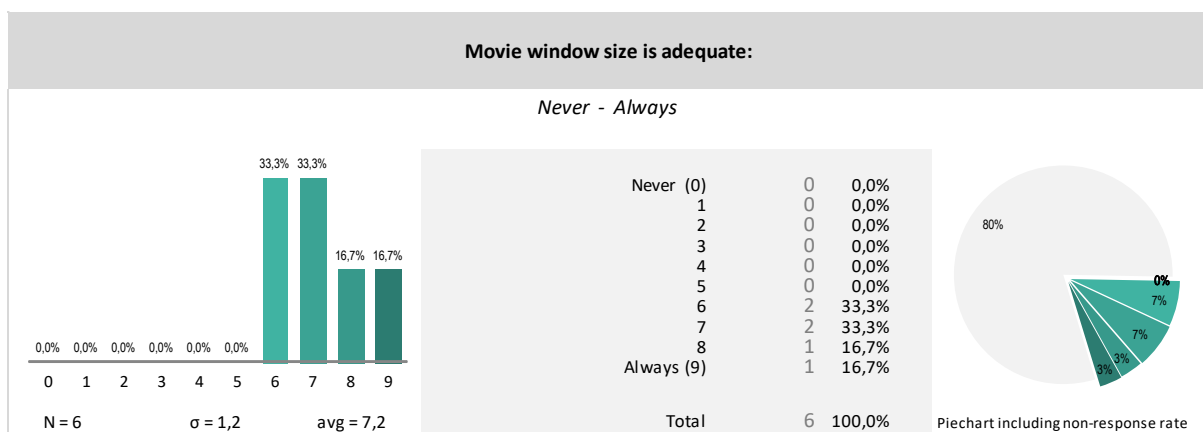


Figure 123: Movie window size is adequate (never – always)

Regarding the audibility and inaudibility of the “Sound output” (g), the standard deviation is 1 for the mean of 7.5. However, 80% of all users did not respond to this item.

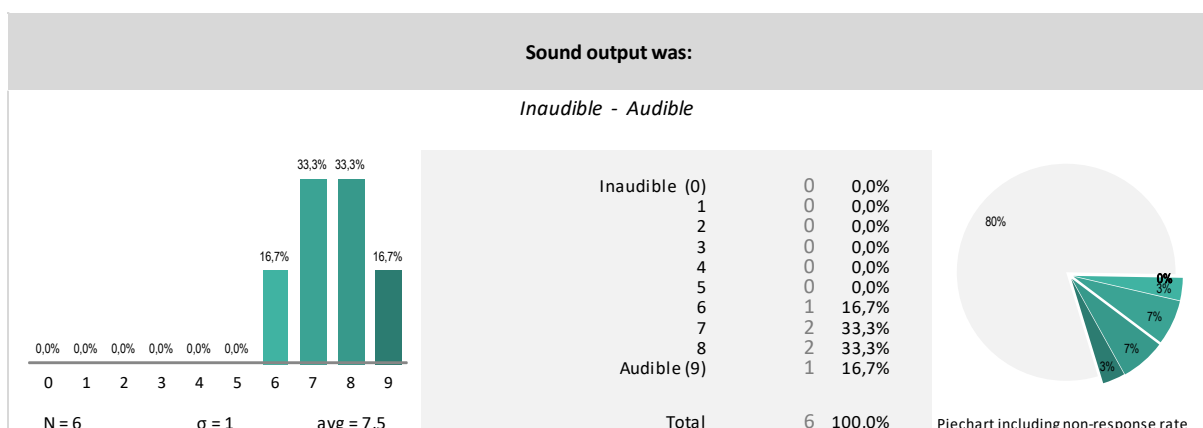


Figure 124: Sound output was (inaudible – audible)

Regarding the choppiness of the “Sound output” (g), the standard deviation is 1 and the mean is as high as 7.8. However, 80% of all users did not respond to this item

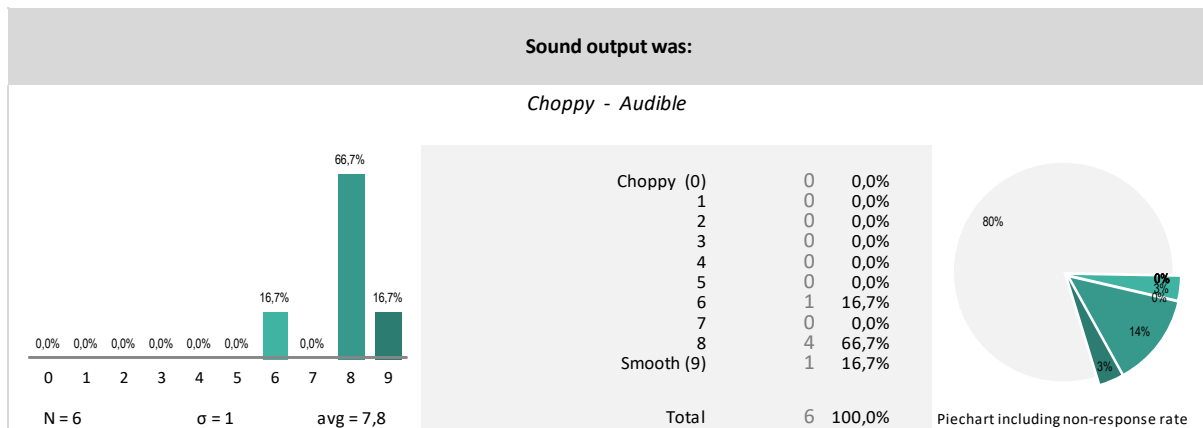


Figure 125: Sound output was (choppy – smooth)

When asked to rate whether “Colours used” were “Unnatural” or “Natural” (i), the average is 7.5 with a standard deviation of 1.4. The response rate was as low as 27% which is odd since the colours used could also include more generally the colours used for the PEP platform. A higher response rate was expected here and possibly the question could be rephrased for further testing during the technology trial.

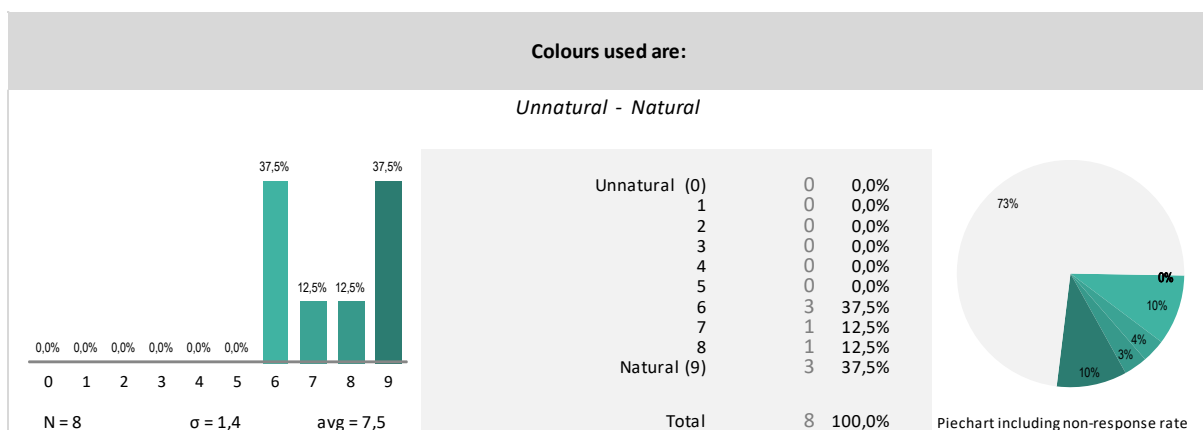


Figure 126: Colours used are (unnatural – natural)

When asked to rate whether “Colours available” are “Inadequate” or “Adequate” (i), the average is 7.2 with a standard deviation of 1.4. The response rate was as low as 30% which is odd since the colours used could also include more generally the colours used for the PEP platform. A higher response rate was expected here and possibly the question could be rephrased for further testing during the technology trial.

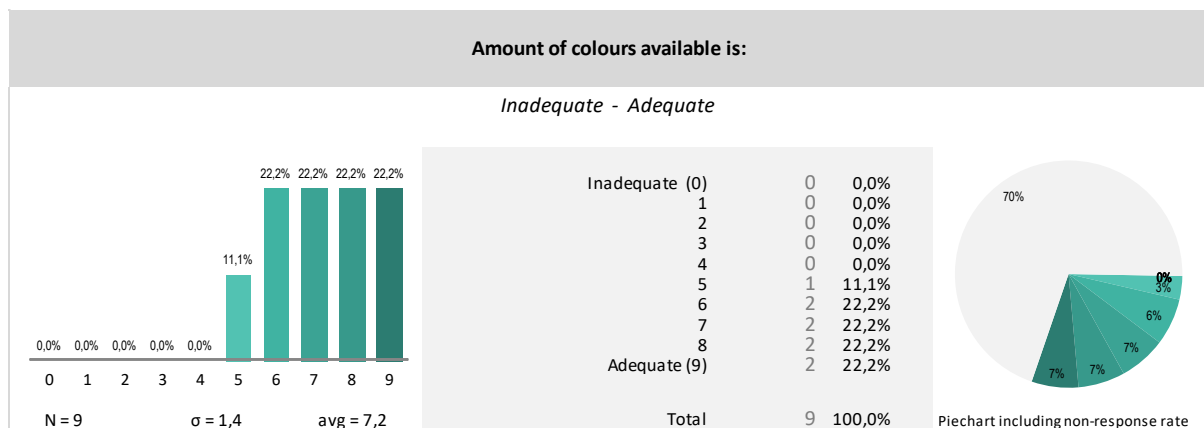


Figure 127: Amount of colours available is (inadequate – adequate)

2.6. Category 6: Tutorials

Test users rated the uselessness or helpfulness of the “The training workshop” (a) with an average 7.3 and a STD of 1.6. 52% of respondents rated the training workshop 8 or 9, implying it was generally perceived helpful. It could be further investigated why 23% of all users did not respond to this item.

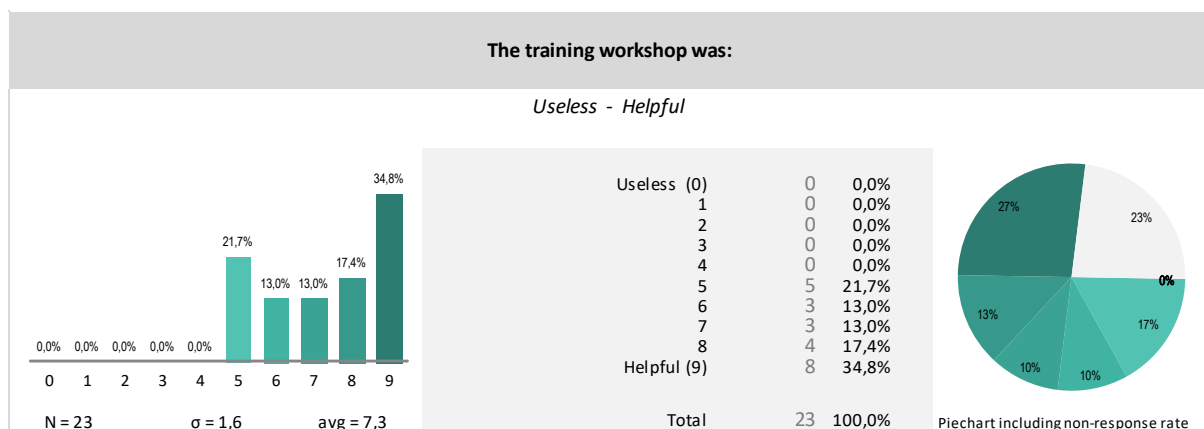


Figure 128: The training workshop was (useless – helpful)

2.7. Category 7: User Manual

When asked to rate whether “The terminology used in the manuals” is “Confusing” or “Clear” (a), the user manual is rated an average of 6.3 with a STD of 2.2. 42% of respondents rated the manual terminology 8 or 9. Yet, another 42% of respondents rated it between 3-5, indicating that there are some confusion parts in the manual terminology. 37% of all users did not respond to this item.

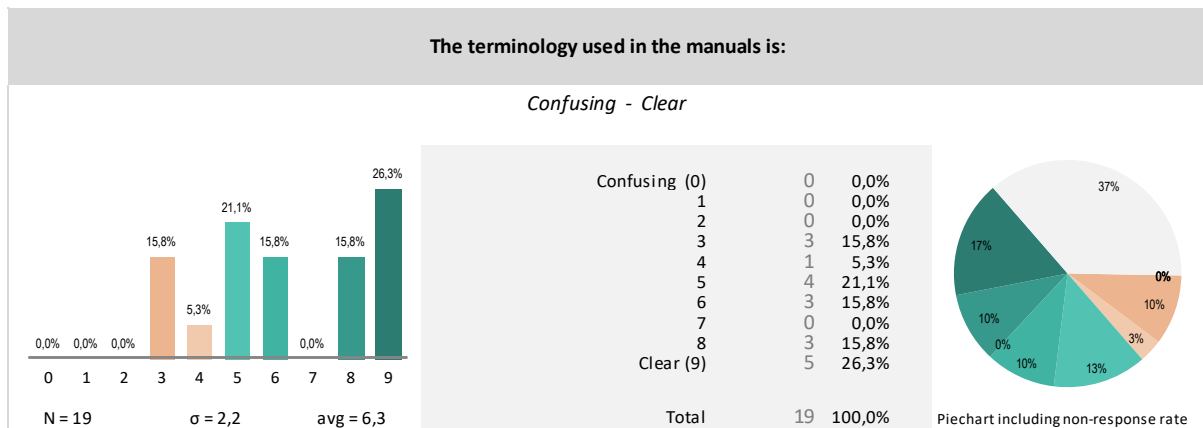


Figure 129: The terminology used in the manuals is (confusing – clear)

Users rated whether “The information from the manual is easily understood” (b) with an average of 6.1 and a STD 1.9. Ratings range from 3-9 and are spread relatively evenly across the spectrum, implying that the manual could use some work to ensure that it can be more easily understood by users. In addition, 33% of all users did not respond to this item.

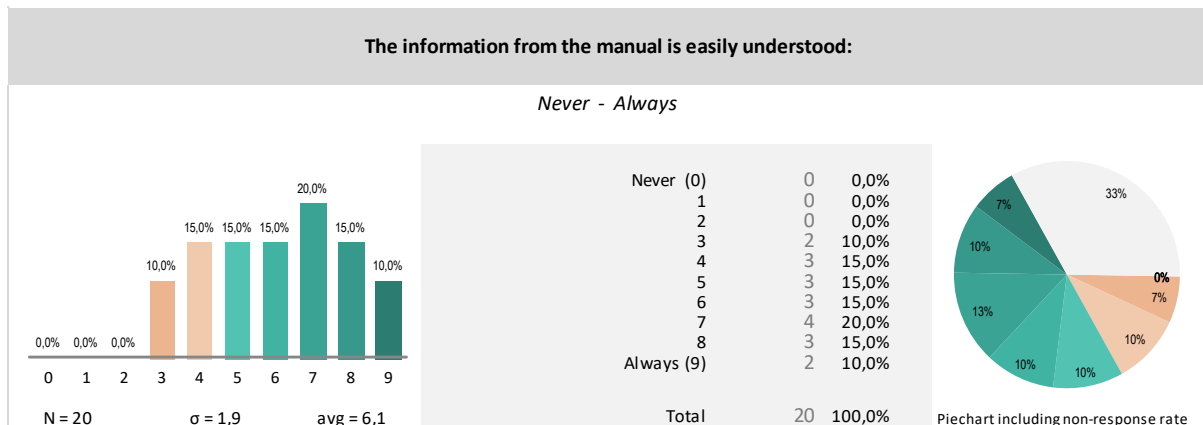


Figure 130: The information from the manual is easily understood (never – always)

When asked to rate if “Finding a solution to a problem using the manual” (c) is impossible or easy, the manual is rated an average of 5.7 with a STD of 2. 52% of respondents rated it 6 or 7, while 36% rate it between 2 and 5. In addition, 30% of users gave no response. It is debatable if users had no need to find a solution using the manual or whether the manual was of sufficient quality to facilitate solution finding. .

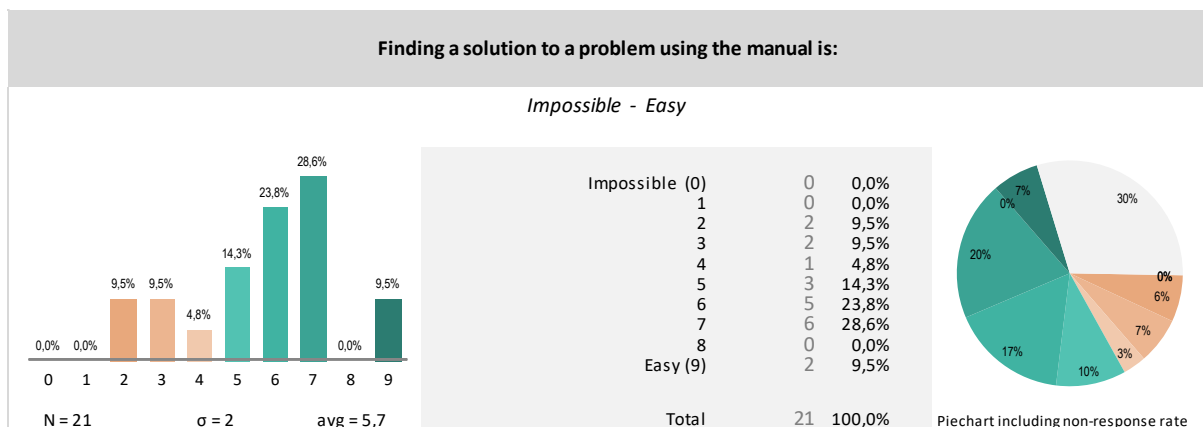
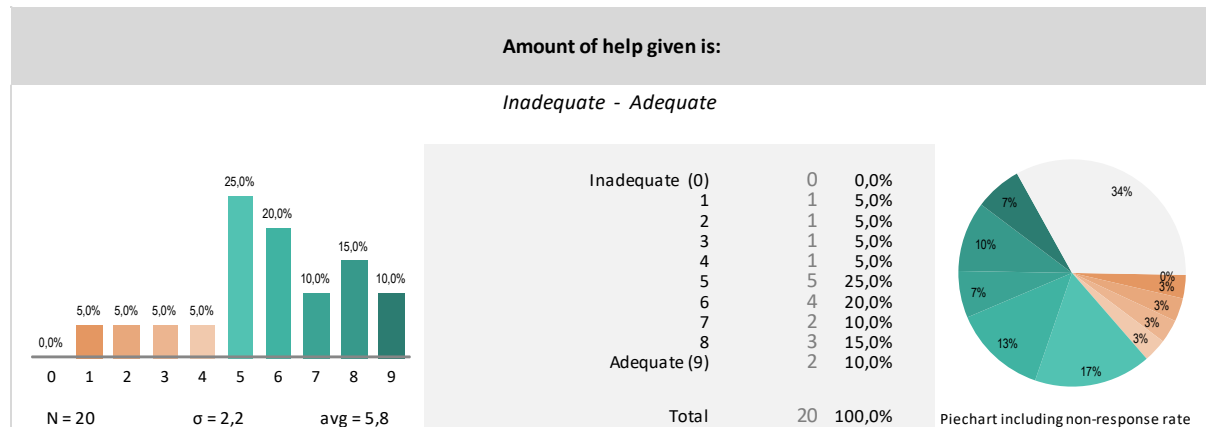
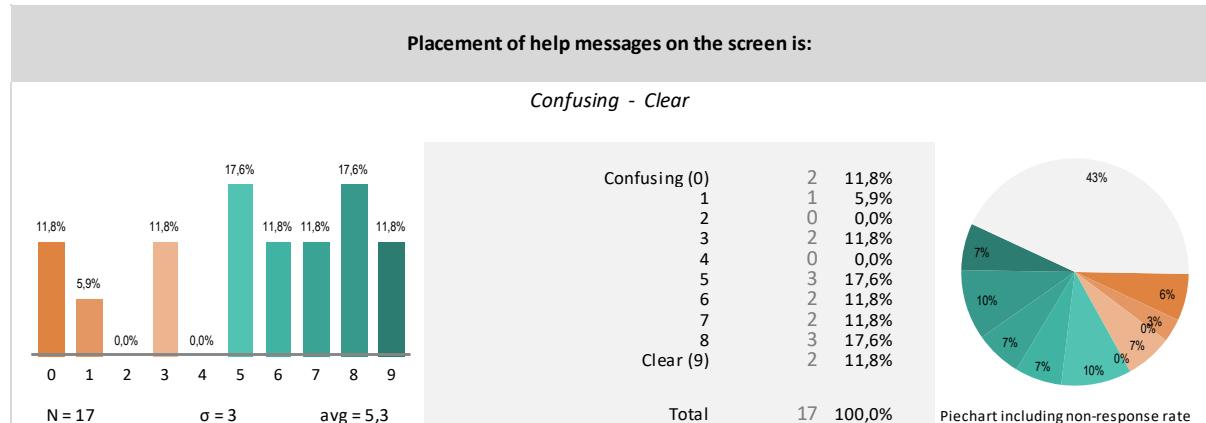


Figure 131: Finding a solution to a problem using the manual is (impossible – easy)

When asked to rate whether the “Amount of help given” (d) is “Adequate” or “Inadequate” users’ rating had a mean of 5.8 with a STD of 2.2. 65% respondents rated it 6 or below, indicating that the amount of help is inadequate for the majority of respondents. 34% of the users did not respond to this item.

**Figure 132: Amount of help given is (inadequate – adequate)**

Regarding how clear or confusing the “Placement of help messages on the screen” is (e), users’ ratings were very heterogeneous, ranging between 0-9 with a mean of 5.3 and a SDT of 3. It could be further investigated why the result is so dispersed and why 30% of respondents were confused by the placement of help messages (rating it 0-4) and why 43% of all users did not respond in the first place.

**Figure 133: Placement of help messages on the screen is (confusing – clear)**

An average of 4.9 with a STD of 3.4 is the rating of how difficult or easy “Accessing help messages” (f) was. While 47% of all users did not respond in the first place, 38% rated the access of help messages difficult (0-3). Interestingly, 50% of respondents rated it 7 and above, indicating that there are some people who found it very easy to access help messages, while the opposite is also true for some people. It could be further investigated why the result is so dispersed and why “accessing help messages” was perceived difficult by many users.

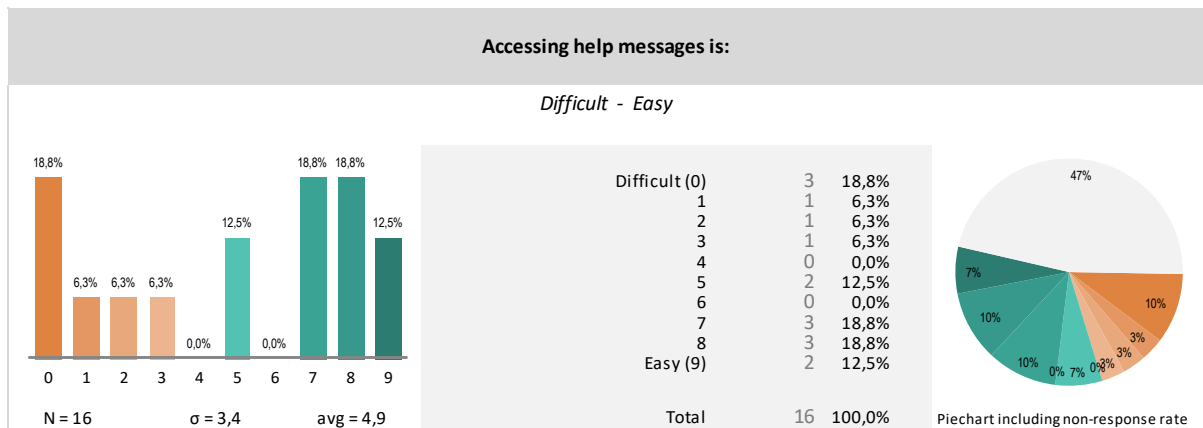


Figure 134: Accessing help messages is (difficult – easy)

2.8. Category 8: System capabilities

In this category users were asked to rate different “System Capabilities” of the PEP. Figure 28

When asked to rate whether “System speed” is “Too slow” or “Fast enough” (a), the average is 7.4 with a STD of 1.5. 65% of respondents’ ratings were between 7 and 9.

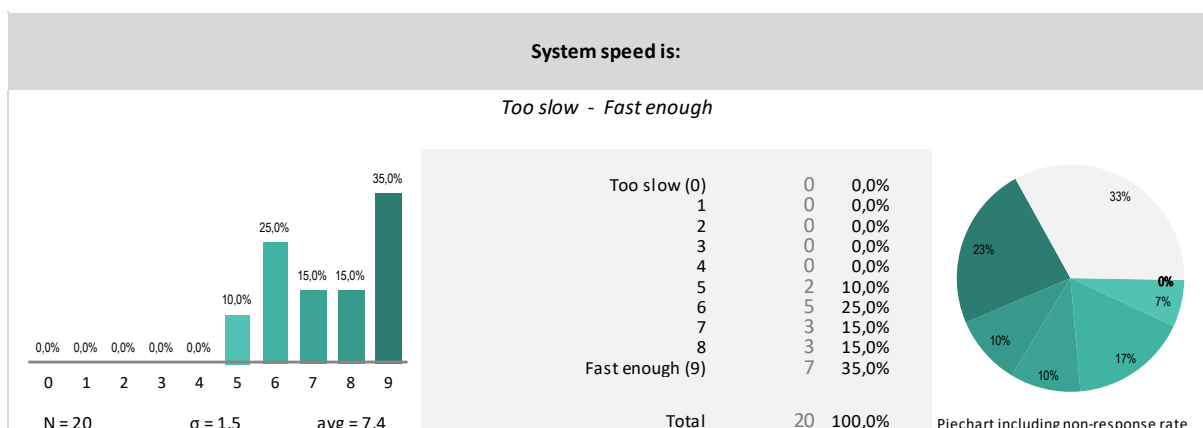


Figure 135: System speed is (too slow – fast enough)

Regarding the “Response time for most operations” (b) and whether they are “Too Slow” or “Fast enough” the respondents rated it an average of 7.7 with a STD of 1.4. It could be checked why the item had a 40% non-response rate.

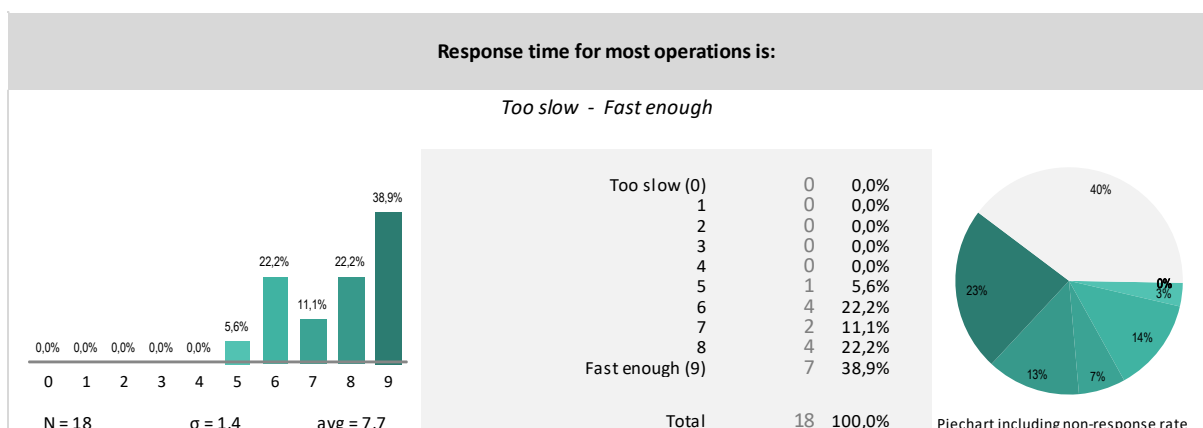
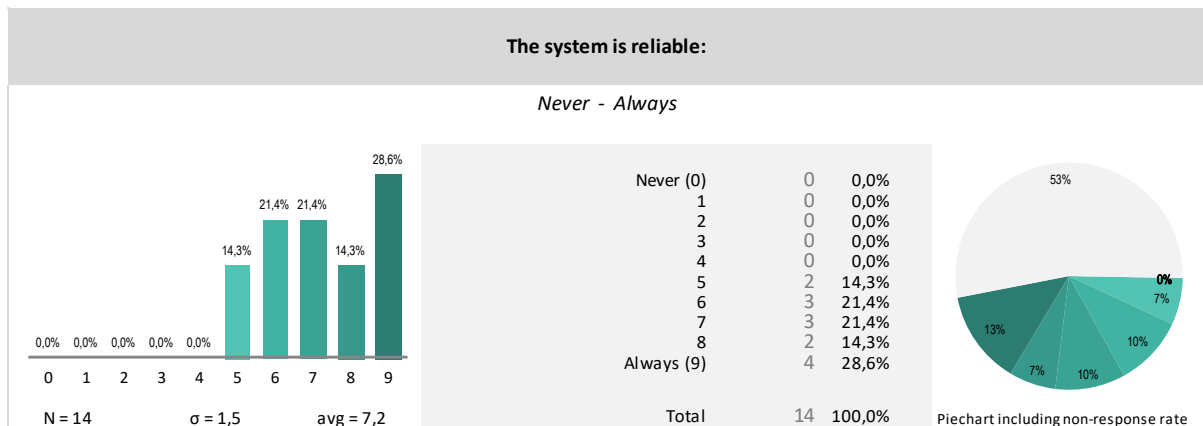
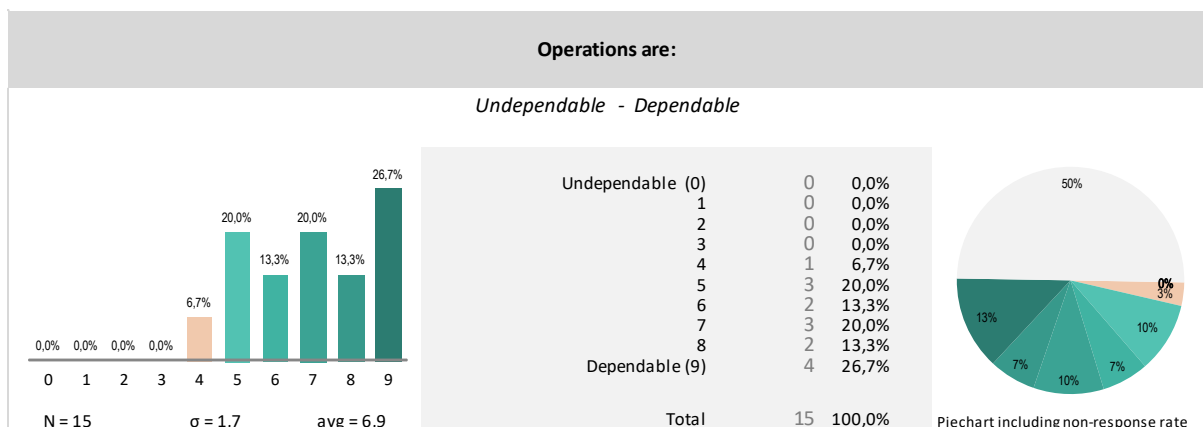


Figure 136: Response time for most operations is (too slow – fast enough)

“System reliability” was rated on a 0-9 scale from “never” to “always”. The mean rating of 7.2 with a STD of 1.5 indicates that the system is experienced as quite reliable. It could be investigated why the item had a 53% non-response rate.

**Figure 137: The system is reliable (never – always)**

Test users rated whether the “Operations” (d) are “Undependable” or “Dependable” with an average of 6.9 and a STD of 1.7. The rating is mostly inclined towards dependable operations. It could be investigated why the item had a 50% non-response rate.

**Figure 138: Operations are (undependable – dependable)**

The occurrence of “System failures” (e) was rated as happening rather seldom. The average rating is 7.4 with a STD of 1.4. It could be investigated why the item had a 57% non-response rate.

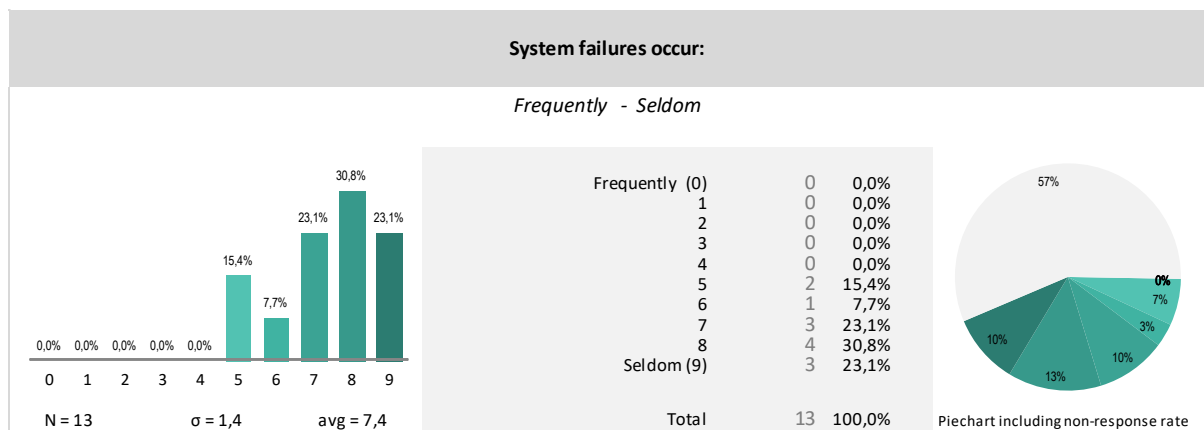


Figure 139: System failures occur (frequently – seldom)

When asked to rate whether “The system warns the user about potential problems” (f) the responses are very heterogeneously dispersed, ranging from 0 (“Never”) to 8 (“Almost always”). The average is 4.7 with a standard deviation of 2.6. 57% of all users did not respond and 62% of respondents rate it 6 or below. It could be further investigated why users thought they would not be warned about potential problems and why the non-response rate was quite high.

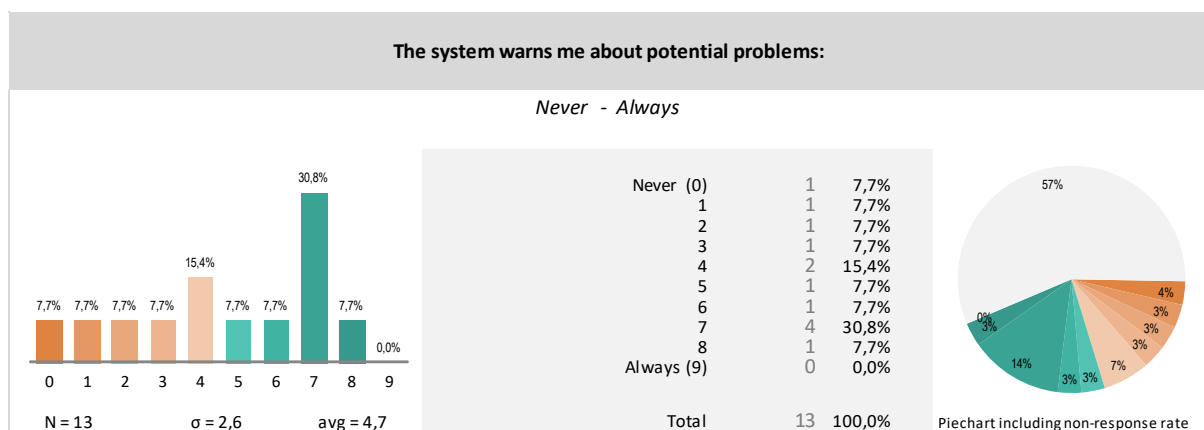


Figure 140: The system warns me about potential problems (never – always)

“Correcting my mistakes” (g), was rated 6.7 in the mean with a STD of 2.2. 60% of respondents rated the easiness to correct mistakes 7 or higher. It could be investigated why the item had a 57% non-response rate.

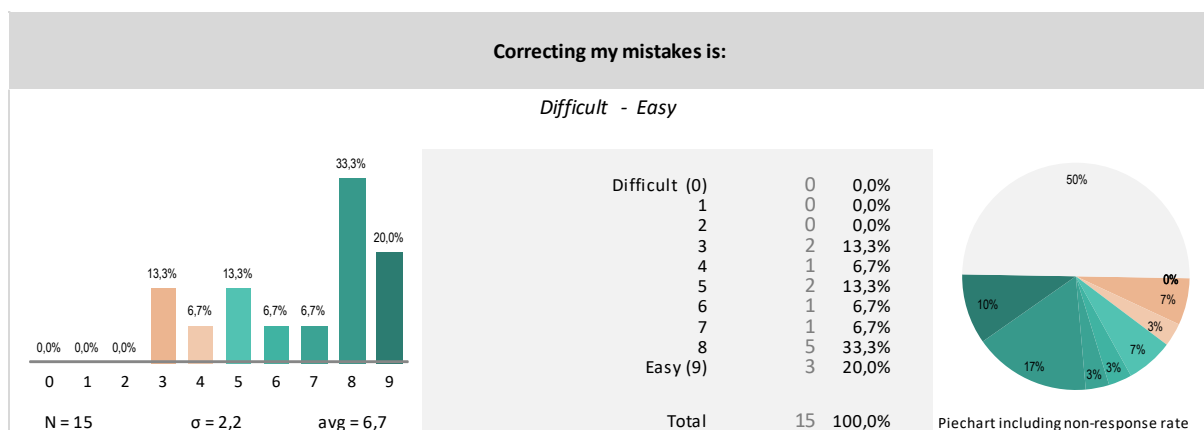


Figure 141: Correcting my mistakes is (difficult – easy)

When asked whether “Correcting typos is” “Complex” or “Simple” (h), the average rating is 6.3 with a STD of 2.1. 50% of respondents rated the easiness to correct typos 8 or 9 (“simple”). It could be investigated why the item had a 60% non-response rate and if the dispersed result could be based on non-occurrence of typos during the training.

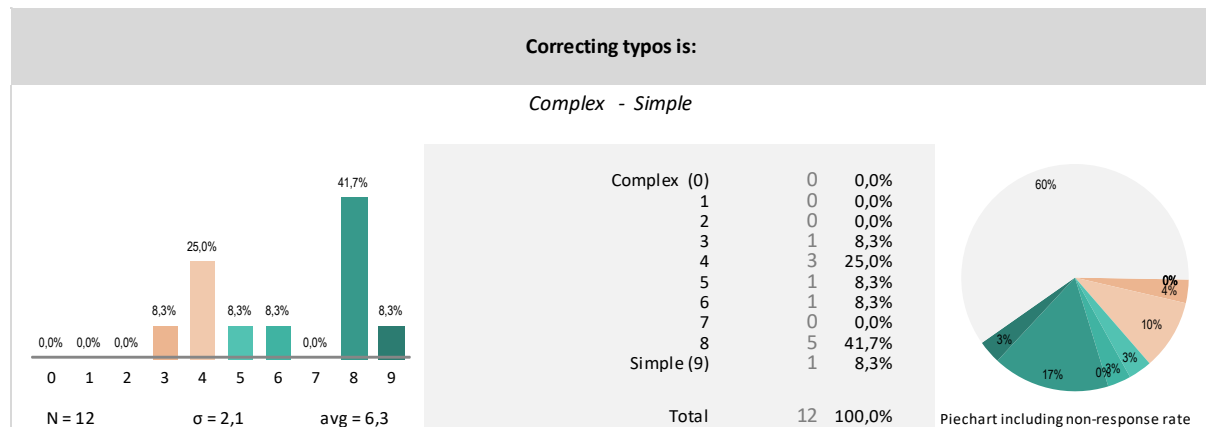


Figure 142: Correcting typos is (complex – simple)

The ratings of “The ability to undo operations” ranged from 3-9 with an average of 6.1 and a STD of 2. The large range and large STD suggested to check why users perceived the adequacy to undo operations so differently. In addition, it could be investigated why the item had a 50% non-response rate.

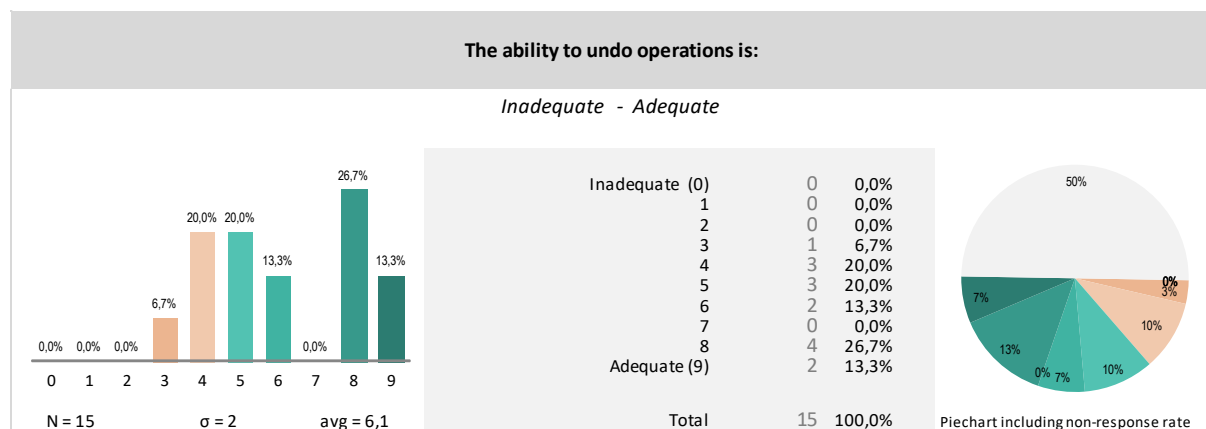


Figure 143: The ability to undo operations is (inadequate – adequate)

Users were asked if “The ease of operation depends on their level of experience” (j) on a 0-9 scale from “never” to “always”. The mean rating is 7.9 with a STD of 1. As much as 61% of the responses lie between 8-9. It could be investigated how operations can be made more intuitive to also support also users that are not very ICT experienced. In addition, it could be investigated why the item had a 40% non-response rate.

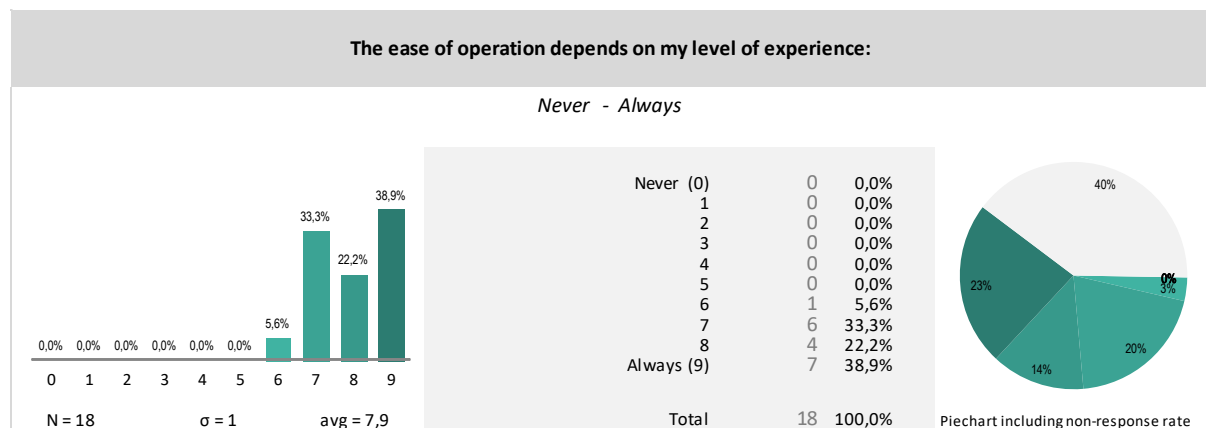


Figure 144: The ease of operation depends on my level of experience (never – always)

Test users rated “I can accomplish tasks knowing only a few commands” (k) with an average 6.9 and a STD of 1.9. The rating is inclined towards “Easily” with 67% of respondents rating it 7 or higher. However, 27% of respondents rated it between 3-5 and it could be investigated why the item had a 50% non-response rate.

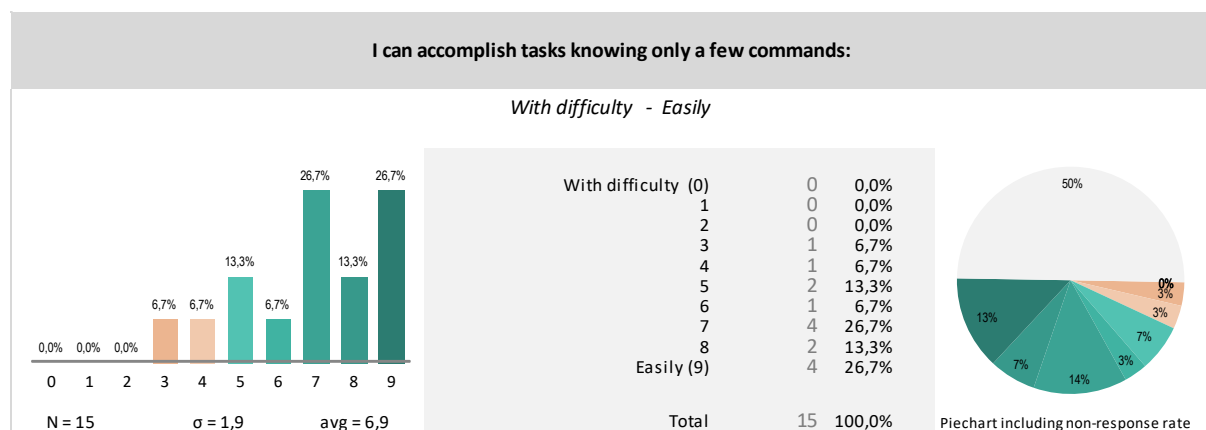


Figure 145: I can accomplish tasks knowing only a few commands (with difficulty – easily)

2.9. Recommendations for further PEP development

It is recommended that technical partners who develop the PEP platform could further investigate the following usability criteria that were rated lower than 5.9 in the mean; that had a STD larger than 2.3 or that had a non-response rate of more than 20%. It is pointed out here that the non-response rate was larger than 20% for 55 of the total of 72 items. The main anticipated reason for the rather high non-response rate is the limited scope of activities performed during the test sessions. Test participants may not have experienced certain aspects of the software component during the test sessions and thus were not able to respond to a number of items during the test session. It is expected that this issue will be resolved when carrying out the QUIS with actual patients during the technology trial.

Table 2: List of usability criteria recommended for further PEP development

Usability item	Mean < 5.9	STD > 2.3	Non-response rate > 20%
Figure 84: The highlighting on the screen is (unhelpful - very helpful)			X
Figure 87: The amount of information that can be displayed on the screen is (inadequate – adequate)		X	

Usability item	Mean < 5.9	STD > 2.3	Non-response rate > 20%
Figure 89: The sequence of screens is (confusing – clear)	X		
Figure 90: The next screen in a sequence is (unpredictable – predictable)	X	X	
Figure 92: Progression of work-related tasks is (confusing – clearly marked)	X	X	
Figure 93: The use of terminology throughout system is (inconsistent – consistent)	X		X
Figure 94: The work related terminology is (inconsistent – consistent)	X		X
Figure 95: The computer terminology is (inconsistent – consistent)	X		X
Figure 96: The terminology relates well to the activities I am doing (never – always)	X	X	X
Figure 97: Computer terminology is used (too frequently – appropriately)	X	X	X
Figure 98: Terminology on the screen is (ambiguous – precise)			X
Figure 99: Messages that appear on the screen are (inconsistent – consistent)			X
Figure 101: Messages that appear on the screen are (confusing – clear)			X
Figure 102: Instructions for commands or functions are (confusing – clear)			X
Figure 103: Instructions for correcting errors are (confusing – clear)			X
Figure 104: The computer keeps me informed about what it is doing (never – always)	X		X
Figure 105: Animated cursors keep me informed (never – always)	X		X
Figure 107: Controlling the amount of feedback is (impossible – easy)		X	X
Figure 108: The length of delay between operations is (unacceptable – acceptable)			X
Figure 109: Error messages are (unhelpful – helpful)			X
Figure 110: Error messages clarify the problem (never – always)			X
Figure 111: Phrasing of error messages are (unpleasant – pleasant)			X
Figure 116: Number of steps per task are (too many – just right)			X
Figure 117: Feedback on the completion of a sequence of steps is (unclear – clear)			X

Usability item	Mean < 5.9	STD > 2.3	Non-response rate > 20%
Figure 118: Quality of still pictures/photographs was (bad – good)			X
Figure 119: Pictures/Photos were (fuzzy – clear)			X
Figure 120: Picture/Photo brightness was (dim – bright)			X
Figure 121: Quality of movies was (bad – good)			X
Figure 122: Brightness of movie images was (dim – bright)			X
Figure 123: Movie window size is adequate (never – always)			X
Figure 124: Sound output was (inaudible – audible)			X
Figure 125: Sound output was (choppy – smooth)			X
Figure 126: Colours used are (unnatural – natural)			X
Figure 127: Amount of colours available is (inadequate – adequate)			X
Figure 128: The training workshop was (useless – helpful)			X
Figure 129: The terminology used in the manuals is (confusing – clear)			X
Figure 130: The information from the manual is easily understood (never – always)			X
Figure 131: Finding a solution to a problem using the manual is (impossible – easy)	X		X
Figure 132: Amount of help given is (inadequate – adequate)	X		X
Figure 133: Placement of help messages on the screen is (confusing – clear)	X	X	X
Figure 134: Accessing help messages is (difficult – easy)	X	X	X
Figure 135: System speed is (too slow – fast enough)			X
Figure 136: Response time for most operations is (too slow – fast enough)			X
Figure 137: The system is reliable (never – always)			X
Figure 138: Operations are (undependable – dependable)			X
Figure 139: System failures occur (frequently – seldom)			X
Figure 140: The system warns me about potential problems (never – always)	X	X	X
Figure 141: Correcting my mistakes is (difficult – easy)			X
Figure 142: Correcting typos is (complex – simple)			X
Figure 143: The ability to undo operations is (inadequate – adequate)			X
Figure 144: The ease of operation depends on my level of experience (never – always)			X

Usability item	Mean < 5.9	STD > 2.3	Non-response rate > 20%
Figure 145: I can accomplish tasks knowing only a few commands (with difficulty – easily)			X

10.7 Appendix 7 Mock-up Feedback on C3DP

C3DP MOCK-UPS FEEDBACK

Thus, it is necessary to prevent doubling time and effort. The actions/activities performed in the local systems of the pilot sites (OG, for Osakidetza) should not be replicated on the C3DP platform and vice versa.

We understand that all the information, tests, surveys, reports, documents, etc. that are performed in local systems and requested by the C3DP platform for the development and/or execution of the Personalized Plan, will be directly loaded, under request, to the C3DP from the local EHR local systems. It should be a two-way process. Moreover, all the information, tests, reports, etc. developed under the C3DP platform should be accessible to the local systems. We have to prevent repeat activities if it is not necessary, addressing an efficient clinical practice.

Comments from SRDC: We would like to avoid this duplication as much as possible of course. We aim to receive all EHR data of selected patients from your local systems, and share the designed care plan back with local care systems. C3DP has no intention to replace prescription or booking. Intentions for prescriptions or bookings will be listed as planned activities in the care plan. The finalized care plan will be shared with care sites; maybe while these care plans are processed by local care system, these planned bookings and prescriptions can be created via your local systems. Let's discuss whether this is practical.

As you have indicated in your detailed comments, there are two additional items that we can share back with local care systems: (1) results of assessment questionnaires (if they are not available from the EHRs we received from the local care system, the user can do the assessments via C3DP as you suggested). These will be shared back with local care site. We have updated this part based on your comment. (2) notes on health concerns: As I explained below, these will be a part of the shared care plan. Let's discuss whether a more direct sharing option is needed.

Detailed comments:

- Slides 2-3: These slides are similar in content to some screens in Osabide Global (OG), the local EHR of Osakidetza in Basque Country. The information is showed in Osabide Global, regarding for example all patients scheduled in a specific day's Agenda. Can you reach patient Care Plan directly from his EHR skipping slide 2?

Comments from SRDC: We will make it possible to open the 'Care Plans' view given a patient ID, skipping the list of patients and Patient Overview Windows.

- Slide 5: Can we only have "visible" the active Plan? The "completed" ones could be reaching under request.



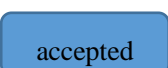



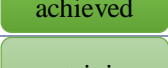
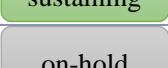
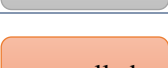


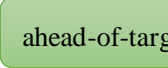

Comments from SRDC: Done, now active care plans and closed care plans are listed separately, and closed care plans section is 'closed' in the default view.

- Slide 7: What is this folder? Is it just where the patient care plans are kept? Or is it for all Care Plans?

Comments from SRDC: We were thinking that here the user imports a care plan document from his/her local folders in his/her computer.

- Slide 8: What do the stars in the goals section mean?

Comments from SRDC: We have previously thought to have a graphical representation of 'goal progress'. As proposed in D3.3 currently we are thinking to use the value set proposed by HL7 FHIR. As it will be ambiguous to map these statuses to a graphical representation with stars, we are proposing the following representation scheme for the status codes, please comment (in between, this value set can also be revised based on your needs, we have copied from FHIR value set, but this is a flexible value set that can be altered):

ValuSet: GoalStatus (http://hl7.org/fhir/ValueSet/goal-status)		
code	Graphical Display	Definition
proposed		A goal is proposed for this patient
planned		A goal is planned for this patient
accepted		A proposed goal was accepted
rejected		A proposed goal was rejected
in-progress		The goal is being sought but has not yet been reached. (Also applies if goal was reached in the past but there has been regression and goal is being sought again)
achieved		The goal has been met and no further action is needed
sustaining		The goal has been met, but ongoing activity is needed to sustain the goal objective
on-hold		The goal remains a long term objective but is no longer being actively pursued for a temporary period of time.
cancelled		The goal is no longer being sought
on-target		The goal is on scheduled for the planned timelines
ahead-of-target		The goal is ahead of the planned timelines
behind-target		The goal is behind the planned timelines
entered-in-error		The goal was entered in error and voided.

- Slide 11: There is a list of Health Concerns in some of the local EHR. Would this slide “pull” data from it? Or will it be done manually here? Or will be semiautomatic?

Comments from SRDC: We aim to receive it automatically from the local systems via the Technical Interoperability Suite.

- Slide 12: Minimental, Barthel and other information.... If they have already been recently performed or updated in the local EHRs, they should be uploaded directly from it (or under request). It should not be necessary to do it again if the information is already stored in the local system. Otherwise, it’s fine to do it using these screens!

Comments from SRDC: It is not seen in this screen, but if such assessment has been previously done, we aim to receive them from local care systems, and we aim to list them under “Care Barriers/PatientStatus”. Based on your previous comment we will add the functionality to send the results of the assessments back to the local care systems. The mockup windows have already been updated. Maybe we can make it the default action to send to the local care system, see the comments in the Invisio.

@Warwick: We assume that it will be possible to receive the results of such assessments if available from local care systems. I have extended the Care Plan Information View in D3.3, and defined new profiles for Observation resource, namely: CareGiverCharacteristicsObservation, CharacteristicsOfHomeEnvironmentObservation, PersonalBliefObservation, FunctionalStatusObservation, MentalStatusObservation and AssesmentScaleObservation.

@Warwick: Based on this new requirement, there should be functionality in TIS to send the results of the assessments done via C3DP back to local care systems

- Slide 16: The notes edited in “Health Concerns” should be transferred and also available in the local EHRs

Comments from SRDC: Currently these are recorded inside the ‘care plan’ and will be available in the ‘care plan’ instance to be shared with local care systems. Is this adequate? Or shall we support a more direct functionality?

- Slide 19: What does “Care Plan Templates” mean? Is it a draft structured care plan based on guidelines recommendations to be customized for the patient? Is it just a blank template to be completed by the Health Professional? Is it just a few selected (but not complete) list of health concerns, goals or interventions?

Comments from SRDC: In Slide 18, the user selects some conditions, and sees the matching clinical guidelines supported by the system. When the user selects the guidelines to be considered, the C3DP will issue a request to CDSM services, to retrieve the ‘guideline based goal and treatment intervention’ suggestions. These are later presented in the screen as depicted in Slide 19. In other words, these will be based on the flowcharts to be identified in T7.1. and implemented in T7.2.

@Warwick, Cambio: Please comment, this is how we envisioned to use CDSM services to collect guideline based suggestions about the goals and treatment options offered by the guidelines.

- Slide 22: What is the difference between Goal and Target? What do exactly both concepts mean? Is it just that the target has a number attached?

Comments from SRDC: ‘Goal definition’ on slide 22, is the textual description of the goal. If the user wishes to add a ‘coded representation of the goal’, then s/he adds the target definition. As depicted in Slide 23, a targeted parameter is selected, such as (Weight Loss, LOINC, 45735-8), then the targeted value can be added, such as ‘2’.

- Slides 22-24: The meaning of these slides was not understood. Could you give a more detailed explanation, please? Will the notes be available too in the local EHRs?
Comments from SRDC: These slides define how a new Goal is defined via the tool. As I have covered in my response to previous question, a textual description of the goal can be added (slide 22), the category, and status of the goal is selected. These will be selected from agreed valuesets. In D3.3.1 we proposed to use value sets suggested by FHIR (<http://hl7.org/fhir/ValueSet/goal-category> and <http://hl7.org/fhir/ValueSet/goal-status>). These are open to comments as previously indicated; we can adapt them based on your needs. In Slide 22, the next item to be defined is the ‘targeted date’ to achieve the goal. As explained, in slide 23 the coded representation of the goal is described. Each goal can be linked with a number of Health Concerns, Slide 24 enables to establish the link between the goal and health concerns of the patient.
- Slide 31: This functionality is already available in Osabide Global. The same comment as for slide number 12. Whichever the platform where the action of booking an appointment is performed, it should be available in both of them.

Comments from SRDC: The definition of Activity is simplified, we will not be defining Appointments, Medication Requests, etc, in detail. Please see the new mockups available in the Invisio.

- Slide 35: Referral to the cardiologist. This functionality is already available in Osabide Global. The same comment that for slides number 12 and 31. It is key not to repeat actions among platforms, where the information is already stored in one of them.

Comments from SRDC: Please see my response to the above question. Not applicable anymore.

- Slide 42: It is proposed to broaden this action/activity, allowing professionals to add/upload related data/information they consider of interest.

Comments from SRDC: Can you elaborate a bit more? Is it specific to ‘appointments’ or any activity definition?

- Slide 55: There are already inter consultation templates available in some of the local EHRs. Information should be available on both platforms to avoid gaps and duplications.

Comments from SRDC: This screen intends to allow the user to initiate the share of care plan with care plan members, i.e. indicating that his/her edit is finalized and wishes to share it with other care team members. While doing so, we thought s/he might want to add some notes.

If there is a specific template for this, we can adopt. Apart from this, if the necessary technical interfaces are provided we can discuss whether integration with your messaging platform can be achieved for Basque pilot

- Slide 61: interesting overview of Care Plans History. However we would need also a screen with a graphic display on a timeline of all coming interventions (one year forward?)

Comments from SRDC: Please see the new mockup for this (accessible from the Care Plan Dashboard View now).

- Slide 62: The clinical documents are already available in Osabide Global.

Comments from SRDC: Here in fact we present the clinical documents that have been exported or pushed to the C3DP platform to be processed by the C3DP system and shared with other care team members via the platform.

This is an important issue to discuss. Let me explain a bit more about the intended communication with the local care systems: As we all agreed we would like to enable the C3DP system to get the clinical context of the patient from the local care sites as much as possible.

In the beginning, when the C3DP Tool is first to be used for the patient, we need to export the patient's medical summary to the system (i.e. to be able to fill in the Patient Dashboard presented in slide 3. In your case, you may not be interested in seeing the screen shown in slide 3, but in any case the C3DP system needs to collect all of these information from the local care sites so that these can be re-used when necessary by the tool, for example for selecting among the current conditions while the 'Health Concerns' to be targeted by the care plan. These patient data will also be shared with Clinical Decision Support modules to be executed by C3DP). The best way to do this can be different in each pilot site, based on the capabilities of your local system. One option is to share an already existing 'Patient summary document' that your systems can already export, and C3DP can receive this via Technical Interoperability Suite (TIS) and Semantic Interoperability Suite (SIS). There may be other options offered by local care sites, which Warwick team needs to discuss with care sites.

In addition to this, maybe based on specific context of the patient (based on the characteristics of the current illness, the care plan being planned), the physicians may want to upload a number of other important clinical documents (such as reports about important surgeries patient has had, lab or radiology reports). This needs to enable as well by TIS and SIS. If these are not machine processable, then the intention is to enable the other care team members to see them via the C3DP interfaces as they may be relevant with the care plan

being collaboratively managed. But if a care site believes that this is not necessary as they can do this via their existing interfaces, then this step may be omitted for their deployment. But we think that it might be beneficial for the care teams to follow the clinical document that may be of relevance to the current running care plan from the C3DP interfaces along with the care plan, of course the final decision is on pilot sites.

Later, while the care plan is being followed, the most recent clinical context of the patient (i.e. recent medications, lab results, new diagnosis etc.) needs to be synchronized with C3DP. We have thought of three possible ways for this:

- (a) If the local sites support, there can be a ‘push’ based interaction between local care site and TIS (which then feeds these to C3DP), i.e. whenever new information is available, for example a new lab result, a new encounter report, a new medication prescribed etc. this information needs to be fed to C3DP via TIS. Warwick needs to discuss the possibility of this with each pilot site, and the technical architecture needed to achieve this.
- (b) If the local site can open a query interface to TIS, then the care team members can manually query the local care site via the C3DP interface, to search for relevant clinical documents or clinical data from the local care system, and to upload them to C3DP via TIS. In this case, the medical professionals need to do this after each encounter with the patient, each lab result, and radiology report, etc, i.e. the important milestones that created new patient data. Here we have thought of two options: (1) searching clinical documents to synchronize the most recent clinical context managed by local care sites with C3DP (Slides 63 and 64), (2) having a resource based interaction with local care systems, i.e. C3DP via TIS can be able to search the most recent ‘medications’, ‘lab results’, ‘conditions’, select the ones to be synchronized with C3DP and upload these clinical data to C3DP (Slide 65).
- (c) If none of the above is possible, then we assume that the local care site is capable of exporting clinical data as documents that can be saved to local computers of medical professionals, and then they can manually upload these to the system (slides 66, 67).

@Warwick: Please review the above description. All of these need to be discussed with each care site, to see what is achievable. Maybe it is already time to start these discussions. Maybe there are other options offered by local care sites that we missed to list

- Slide 64: What does “synchronize” mean? Would it cover all the above mentioned concerns on gaps and duplications?

Comments from SRDC: It initiates the Option (b) listed above, i.e. when the user clicks it on Slide 62, the process follows with Slide 63-65.

ANNEX 2

Mock-ups feedback on PEP of SWFT

The feedback included the following:

Feedback of patients on PEP	MEDIXINE Comments
They found the system very patient focused / patient-centric	
Dates should be presented in the UK format, e.g. 21/03/2018	The date formats were not handled in the earlier version with manually generated data (non-integrated). Now with the live integration, we have included also the proper “localized” formatting of dates and times (the format is set in system configuration). I just noticed that the current config seems to use US format. Is this so?
They didn’t like some of the phrasing. In particular, the term dietary ‘restrictions’ – they felt it was negative	PL: Texts entered into the careplan in C3DP. To give an example what you can do, I tested changing in the “restrictions” entry to “recommendations”.
It may be better to avoid using units of measure for patients, e.g. for blood pressure they understand 130/80 on its own	PL: Texts entered into the careplan in C3DP.
The language used needs to be reviewed in detail so that it is more easily understood by patients and in some places simplified. For example, the patients didn’t really understand the concept of ‘chronic disease’	PL: I agree it is important that you set the texts in care plan (titles and descriptions) such that they make sense and are easily understood by the patient.
When questionnaires are submitted a message is given that the answers will be reviewed and discussed with the patient. They felt that we need to be sure that this will happen as we could be setting false expectations. If patient complete questionnaires they will be disappointed if they are not acted on. Healthcare professionals have busy schedules so this could easily happen	PL: Each pilot can fully control the displayed text after the Q has been completed. Configurable text per questionnaire (if not set, default text in dictionary used). I agree fully with what you say. Very important that texts reflects reality.
They feel that the Care Plan Feedback questionnaire could be improved and simplified. They suggested that we could have just pick lists with a single comments box rather than lots of free text boxes. They felt there was some duplication	PL: This was something I as a techhie quickly put together to help you discuss the use of questionnaire for this feedback as an alternative to the other previously defined methods. Please let me know the preferred content/structure of the form (if this is the preferred way to collect the feedback). A simple word is for instance a good way for you to share this. Btw the partial texts were intentional to help you notice where you can put in description and examples of what you would want the patient to enter.
On some screens there are ‘Next’ buttons but no	PL: If this refers to questionnaires,

<p>‘Back’ buttons. In some cases the patients wanted to go back to a previous screen and couldn’t</p>	<p>there is a configuration for each questionnaire whether to display navigation within the questionnaire. If enabled, you can easily go back to a previous page. Also if the review page is configured to be used at the end of the questionnaire, the user can go back to previous pages.</p>
<p>Without any prompts from Chris and I, they felt that it was extremely important to include over the counter medications and complimentary therapies!!</p>	<p>PL: Let’s clarify. For what purpose would they enter here. To share with the team or something else? Would the professionals use this information? How does this align with the simple form to report previous encounters and medications as free text (what you defined in January)?</p>
<p>A major point they raised was about having visibility in PEP of the following:-</p> <ul style="list-style-type: none"> · All of their medical conditions (as some patients don’t always know what they are being treated for or have been diagnosed with!) · All of the medications they are taking 	<p>PL: Let’s clarify. Where would you want these to displayed. Separately or as part of the care plan display? Only the conditions in the care plan or all conditions in the FHIR repo for the patient (are these different?)? If separate and as structured data, it could be like below</p>

10.8 Appendix 8 Mock-up Feedback on PEP

PEP MOCK-UP FEEDBACK

The feedback from SWFT included the following:

Feedback of patients on PEP	MEDIXINE Comments
They found the system very patient focused / patient-centric	
Dates should be presented in the UK format, e.g. 21/03/2018	The date formats were not handled in the earlier version with manually generated data (non-integrated). Now with the live integration, we have included also the proper “localized” formatting of dates and times (the format is set in system configuration). I just noticed that the current config seems to use US format. Is this so?
They didn’t like some of the phrasing. In particular, the term dietary ‘restrictions’ – they felt it was negative	PL: Texts entered into the careplan in C3DP. To give an example what you can do, I tested changing in the “restrictions” entry to “recommendations”.
It may be better to avoid using units of measure for patients, e.g. for blood pressure they understand 130/80 on its own	PL: Texts entered into the careplan in C3DP.
The language used needs to be reviewed in detail so that it is more easily understood by patients and in some places simplified. For example, the patients didn’t really understand the concept of ‘chronic disease’	PL: I agree it is important that you set the texts in care plan (titles and descriptions) such that they make sense and are easily understood by the patient.
When questionnaires are submitted a message is given that the answers will be reviewed and discussed with the patient. They felt that we need to be sure that this will happen as we could be setting false expectations. If patient complete questionnaires they will be disappointed if they are not acted on. Healthcare professionals have busy schedules so this could easily happen	PL: Each pilot can fully control the displayed text after the Q has been completed. Configurable text per questionnaire (if not set, default text in dictionary used). I agree fully with what you say. Very important that texts reflects reality.
They feel that the Care Plan Feedback questionnaire could be improved and simplified. They suggested that we could have just pick lists with a single comments box rather than lots of free text boxes. They felt there was some duplication	PL: This was something I as a techie quickly put together to help you discuss the use of questionnaire for this feedback as an alternative to the other previously defined methods. Please let me know the preferred content/structure of the form (if this is the preferred way to collect the feedback). A simple word is for instance a good way for you to share this. Btw the partial texts were intentional to help you notice where you can put in description and examples of what you would want the patient to enter.
On some screens there are ‘Next’ buttons but no ‘Back’ buttons. In some cases the patients wanted to	PL: If this refers to questionnaires, there is a configuration for each questionnaire

Feedback of patients on PEP	MEDIXINE Comments
go back to a previous screen and couldn't	whether to display navigation within the questionnaire. If enabled, you can easily go back to a previous page. Also if the review page is configured to be used at the end of the questionnaire, the user can go back to previous pages.
Without any prompts from Chris and I, they felt that it was extremely important to include over the counter medications and complimentary therapies!!	PL: Let's clarify. For what purpose would they enter here. To share with the team or something else? Would the professionals use this information? How does this align with the simple form to report previous encounters and medications as free text (what you defined in January)?
<p>A major point they raised was about having visibility in PEP of the following:-</p> <ul style="list-style-type: none"> · All of their medical conditions (as some patients don't always know what they are being treated for or have been diagnosed with!) · All of the medications they are taking 	PL: Let's clarify. Where would you want these to be displayed. Separately or as part of the care plan display? Only the conditions in the care plan or all conditions in the FHIR repo for the patient (are these different?)? If separate and as structured data, it could be like below

10.9 Appendix 9 Summary of Revised PARs

The pilot application requirements (PARs) were elicited and reported in D8.1. They were further refined through the component design and development in WP3. The full list of PARs were reviewed by members of the Clinical Reference Group at the Istanbul Plenary Meeting in May 2018. Updates and status are listed in the table below.

PAR ID	PAR description	Status
PAR-1	As a Patient/Informal Care Giver, I need to access Patient Empowerment Platform to learn about treatment options, about how drugs work along with their benefits.	Valid Clarification needed
PAR-2	As a Patient/Informal Care Giver, I need to access Patient Empowerment Platform to learn about my condition (when possible through interactive educational material)	Valid Clarification needed
PAR-3	<u>Updated:</u> As a Health Professional and/or Social Worker in the MDT, I need to access the EHRs of the patient, relevant to related careplan information only. <u>Previous:</u> As a Health Professional and/or Social Worker in the MDT, I need to access the EHRs of the patient.	Valid Reworded
PAR-4	As a Health Professional and/or Social Worker in the MDT, I need to access the EHRs of the patient to record clinical assessment findings and the diagnosis.	SWFT- not valid Check if Invalid in Basque Country as well
PAR-5	Personalised Care Plan Development Platform and Coordinated Care and Cure Delivery Platform needs to be updated about the recent context of the patient (i.e. new clinical assessment findings, diagnosis, lab results, referrals, consult notes, discharge notes), in order to share them with all MDT and also in order to be able to run Clinical Decision Support Modules with the most recent patient context while assisting MDT members.	Valid
PAR-6	As a Health Professional in the MDT, in each encounter I want to review patient's health record, check the progress and any risks of non-adherence (compliance) and complication, and define new or update existing goals and timing, intervention and self-care activities.	Valid Clarification needed
PAR-7	As a Health Professional in MDT, I want the support of Personalised Care Plan Development Platform for reconciliation of clinical guidelines for multiple conditions (such as hypertension, diabetes, renal failure and heart failure).	Valid
PAR-8	As a Health Professional in MDT, I want the Clinical Decision Support Modules to continuously scan data from patient device measurements and patient herself (e.g. questionnaires) as well as new clinical guidelines to alert me when there is a need to update the care plan of the patient.	Dropped

PAR ID	PAR description	Status
PAR-9	As a Health Professional in MDT, I want the support of Clinical Decision Support Modules to advise me medication updates based on the current conditions/medications of the patient by also considering drug interactions.	Valid
PAR-10	As a Health Professional in MDT, I want the support of Clinical Decision Support Modules to advise me goals, interventions such as treatment options including medications, diagnostic procedures, goal-oriented lifestyle and activity modifications based on the current conditions of the patient.	Valid
PAR-11	The tools supporting editing of care plans shall make clear the responsible editors of different sections of care plan.	Valid Nice to have feature
PAR-12	As a Patient, I want to see and accept/reject the care plan listing the identified problems, potential risks, goals, management strategies and intended outcomes.	Dropped Care plans seen by patient are considered to be accepted.
PAR-13	As an Informal Care Giver appointed on behalf of the patient, I want to see and accept/reject the care plans of my loved ones listing the identified problems, potential risks, goals, management strategies and intended outcomes.	Dropped As PAR-12.
PAR-14	As a Health Professional in MDT, I want to share the updated care plan along with my clinical notes/progress notes/discharge summary with all MDT members.	Dropped Not achievable in pilots.
PAR-15	It should be possible to export the approved care plan from the Personalised Care Plan Development Platform to the patient's medical record.	Dropped Not achievable, but a PDF export is available.
PAR-16	As a Patient, I want to be notified if my existing care plan is updated, highlighting the changes.	Valid Needs clarification
PAR-17	As an Informal Care Giver appointed on behalf of the patient, I want to be notified if the existing care plans of my loved ones are updated, highlighting the changes.	Valid Needs clarification
PAR-18	As a Patient I want to give access rights to my loved ones to view my care plan.	Valid Needs clarification
PAR-19	As an Informal Care Giver I want to see a copy of the care plan of my loved ones (if access is granted).	Valid Needs clarification
PAR-20	As a Patient I want to be advised about how to follow the care plan.	Valid
PAR-21	As a Patient I want to get SMS notifications about my interventions planned in my care plan (such as medications).	Dropped
PAR-22	As a Patient, I need to access drug interaction information.	Dropped For safety reasons, clinicians to review what patients can view.
PAR-23	As a Patient/Informal Care Giver, I want to be able to remotely get in touch with social care services.	Dropped Role access limitations
PAR-24	As a Patient I want to be able to schedule next appointment	Dropped

PAR ID	PAR description	Status
	with my Primary Care Provider.	
PAR-25	<p><u>Updated:</u> As a care team manager, I want a mechanism to add a social worker/specialist as a member of the MDT.</p> <p><u>Previous:</u> As a Social Worker/Specialist, I want a mechanism to become a part of MDT.</p>	Valid Reworded
PAR-26	As a Social Worker/Specialist, I want to access the recent context (i.e. care plan) of the patient after my membership to MDT is approved by the Care (Plan) Manager.	Valid
PAR-27	<p><u>Updated:</u> As a care team manager, I want to specify the next care plan team review.</p> <p><u>Previous:</u> As a Health Professional in MDT, I want to specify the next Care Plan Review meeting.</p>	Valid Reworded
PAR-28	<p><u>Updated:</u> As a Health Professional or Social Worker in the MDT, I want to define new goals and activities for the patient.</p> <p><u>Previous:</u> As a Health Professional or Social Worker in MDT, I want to define new specialized care plans for the patient.</p>	Valid Reworded
PAR-29	<p><u>Updated:</u> As a care team member, I want to be able to add the referral request to the patient's care plan.</p> <p><u>Previous:</u> As a Social Worker / Health Professional in MDT, I want to initiate referrals to another Specialist by sharing the information about the patient's medical history including the recent diagnosis, reasons for referral and requested services.</p>	Valid Reworded
PAR-30	As a Health Professional in MDT, I want to invite another Specialist to MDT after referrals so that they can see the information about the patient's medical history including the recent diagnosis, reasons for referral and requested services, and also active and previous care plans.	Dropped No need for referral – the health professional is added to the care team.
PAR-31	As a Health Professional in MDT, I want to invite Homecare social care providers such as Municipality nurses and nurse assistants to MDT so that they can see the information about the patient's medical history including the recent diagnosis, reasons for referral and requested services, and also active and previous care plans.	Dropped As PAR-30.
PAR-32	Coordinated Care and Cure Delivery Platform needs to be updated about the recent context of the patient from the social care services in order to share them with all MDT and also in order to be able to run Clinical Decision Support Modules with the most recent patient context while assisting MDT members.	Dropped Related to PAR-23.
PAR-33	As a member of MDT, I want to be able to communicate with	Valid in BC, RJH

PAR ID	PAR description	Status
	the other members of MDT via asynchronous messaging and video calls.	
PAR-34	As a member of MDT, I want to access web based educational material related with the care of the patient.	Valid
PAR-35	<u>Updated:</u> As a MDT Member, I want to access the readings from remote monitoring systems and connected devices, such as wireless medical sensor devices. <u>Previous:</u> As a MDT Member, I want to access the readings from remote monitoring systems such as wireless medical sensor devices.	Valid Small scale pilot Reworded
PAR-36	As a Patient/Informal Care Giver, I want to access the readings from remote monitoring systems such as wireless medical sensor devices from the Patient Empowerment Platform.	Valid
PAR-37	As a Health Professional in MDT, I want to be notified about the deviations of the remote monitoring systems readings from the set goals in the care plan and the abnormal results, which can trigger updates in the care plan.	To review as part of small scale pilot (Dropped)
PAR-38	As a Health Professional in MDT, I want to be notified about the selected pre-emergency situations detected through the abnormal results in remote monitoring results via SMS messages .	To review as part of small scale pilot (Dropped)
PAR-39	As a Patient I want to be notified about the selected pre-emergency situations detected through the abnormal results in remote monitoring results via SMS messages.	To review as part of small scale pilot (Dropped)
PAR-40	As a Health Professional in MDT, I want to be notified about the identified trends for the selected remote monitoring systems readings .	To review as part of small scale pilot (Dropped)
PAR-41	As a Health Professional in MDT, I want to update the care plan when triggered by notifications about the deviation of readings of remote monitoring systems and abnormal results.	To review as part of small scale pilot (Dropped)
PAR-42	As an Informal Care Giver, I want the ability to get online contact with MDT members of my loved ones.	Valid Clarification needed
PAR-43	As a Health Professional in MDT, I want to be able to review the recent patient context from C3DP and organize a virtual case review Meeting.	Valid
PAR-44	As a Health Professional in MDT, I want to be advised by the Clinical Decision Support Modules employed by C3DP, about treatment options (such as starting/stopping drugs based on the most recent context of the patient including the changes in the recent remote monitoring results) .	Valid
PAR-45	As a Patient, I want to access a copy of my discharge summary along with discharge care plan.	Dropped Not possible at sites.

PAR ID	PAR description	Status
PAR-46	As a Health Professional, I want the support of Clinical Decision Support Modules for identification of diagnosis based on recent lab results based on clinical guidelines.	Dropped No CDS requirement.
PAR-47	As a Health Professional in MDT, I want the Patient to have the ability to fill in questionnaires via the Patient Empowerment Platform.	Valid
PAR-48	As a Patient, I need to upload photos of my meals to the Patient Empowerment Platform.	Valid
PAR-49	As a Health Professional in MDT, I want to access patient specified information such as questionnaires filled, files uploaded via the Patient Empowerment Platform.	Valid
PAR-50	As a Patient, I want to get in contact with the Health Professionals in MDT via messaging.	Valid Clarification needed
PAR-51	As a Patient, I want to get in contact with the Health Professionals in MDT via video conferencing.	Dropped (Conditionally valid)
PAR-52	As a Patient, I want to have automatic coaching regarding life style, blood pressure and blood glucose measurements.	Dropped No longer a requirement from pilot sites.
PAR-53	As a Patient I want to have personalized guidance/information from the Patient Empowerment Platform based on my most recent context (answers given on questionnaires and on data from the EHR (diagnoses, medication, lab) but also based on data from devices).	Valid
PAR-54	As a Health Professional in MDT, I want to get timely notifications about the interventions in the care plan that need to be carried out by me.	Valid
PAR-55	As a Health Professional in MDT, I want to get notifications when the patient makes many unsuccessful attempts to use Patient Empowerment Platform.	Dropped No longer required.
PAR-56	The system shall enable to ascertain who the lead clinician and care plan manager would be.	Valid
PAR-57	The system shall ensure authentication of users, preferably with their existing business user accounts	Valid
PAR-58	The system shall ensure that no unauthorised user is able to access sensitive data.	Valid
PAR-59	The system shall provide a mechanism for dynamic management of access control policies.	Valid
PAR-60	The system shall audit all data access and exchange	Valid

PAR ID	PAR description	Status
	transactions for non-repudiation.	
	New PAR needed for patient care plan feedback	To be clarified