

Bruno Klauser and Nadja Weisskopf

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### Authors:

Bruno Klauser, [bklauser@cisco.com](mailto:bklauser@cisco.com)

Nadja Weisskopf, [nadja.weisskopf@gmail.com](mailto:nadja.weisskopf@gmail.com)

### Coaching:

Marcel Uhr, [marcel.uhr@soultank.ch](mailto:marcel.uhr@soultank.ch)

### Industry Partner:

Tim Johnson, [tjohnso@cisco.com](mailto:tjohnso@cisco.com)

# Abstract

The purpose of this study is to analyze the influence of context and perceived stress on the use of Cisco's Smart Call Home web application. Smart Call Home is a network diagnostic system based on a combination of agents embedded within the network and post-processing of messages on the Cisco.com backend. The main contribution of this work is the identification of relevant stressors and contributing factors specific to the respective contexts of use as well as recommendations for supporting context aspects as well as for reinforcing positive and mitigating negative effects.

Mainly qualitative, User Centered Design (UCD) methodology such as a HCI Expert Review, Contextual Inquiry or Prototyping, is utilized in this study. While UCD and project management methodology is based on well known approaches, taking into account stress related aspects requires a modified and improvised adaptation of methods. The application of each method is explained in detail, showing the relevance, the exact implementation and the outcome.

The work items and artifacts of the applied methods cover the principal components of human-machine interaction – user, context, system and task, a model defined by Shackel and Richardson. Four archetypal users are revealed, which mainly differ in job roles, skills and workplace. In this regard also four distinct contexts result from the analysis, mainly varying in working conditions, tools available and the ambience. Perceived stress as well as contributing stressors are identified and categorized. Potential Smart Call Home users mention distractions from other team colleagues, too much irrelevant data or not enough detail as some of the main contributing factors. The majority of stressors are common between users. Smart Call Home is analyzed and compared against usability heuristics and against findings from requirements engineering and interaction design artifacts. Possible advancements to Smart Call Home are identified in all areas defined by Theo Mandel: structure, presentation and behavior.

The authors therefore recommend to adjust and augment the current Smart Call Home web application to address specific characteristics of the contexts, to mitigate the effects of stress and possibly also to increase the focus on wants and needs of the archetypal users. The user's information retrieval can be simplified by providing overall search functionality and a consolidated overview of key information. Offering mobile use of Smart Call home does justice to the varying workplace characteristics. Even small additions such as breadcrumb navigation can increase the user's confidence and efficiency. Thinking of the improved user experience and satisfaction motivates and inspires to enhance Smart Call Home, based on the findings and recommendations.

Note: As proven by customer adoption, Smart Call Home today already provides useful functionality and information. There is no doubt the concept and implementation exhibit many positive and powerful characteristics. While we may occasionally refer to the beauty and strength of the current implementation, the objective of this report requires a focus on weaknesses and opportunities for future innovation and improvement.

# Introduction

This study has been a great possibility to experiment with recently learnt methods and to act in a real, productive environment of the Industry Partner. We believe the results of this study satisfy our desire to expand our knowledge as well as Cisco's requirement to advance Smart Call Home. It has been a great challenge for us to deal with users from abroad. This has required an adaptation of conventional methodology to assure high-quality information without being face-to-face. Achieving to approach methods without constraints and restrictions and being able to adapt methodology according to our aims has enabled us to exceed our boundaries. After completion of this work, we are now, of course, very keen on hearing about any recommendations implemented in future releases.

## How To Read

Academics should read the work chronologically. The chapters are organized in a natural progression. For anyone not familiar with the objectives of this study, please read chapter 1 **Objective**. Otherwise, to begin with, we recommend reading chapter 5 **Background**, with detailed background information to Smart Call Home and to terms and aspects of stress. This chapter assures a basis when we elaborate on the subject in following chapters. We believe there are three major interests in this work.

One is a special requirement in reading about HCI methodology, which can be satisfied mostly by reading chapter 3 **Methodology** as well as Appendix III – Methodology, where the artifacts are shown. Chapter 3 **Methodology** might give thought-provoking impulse for a user-centered approach in future development projects.

The second main interest is the implementation of the methods and the analysis, described in chapter 4 **Completed Work**. This chapter precedes the findings and recommendations and shows artifacts, discoveries and the analysis.

If you only have a little time and your main aim is to find out more about the findings and recommendations, you are welcome to read chapter 5 **Results and Discussion**. This third mentioned area will presumably be of greatest interest to Cisco. We also recommend that the Smart Call Home project team to read chapters 4.3 **Deliverables** and 6 **Future Work**. Chapter 4.3 **Deliverables** contains categorization, comparison and detailed description of the four hypothetical archetypes of actual users of Smart Call Home. This information can be helpful in future discussions within the Smart Call Home project team. Chapter 6 **Future Work** shows the next steps to implement the recommendations and should serve as decision guidance.

Chapter 7 **Lessons Learnt**, is preferential to the academics and contains self-reflecting statements.

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# 1 Objective

## In This Chapter

Within this chapter you will read about the project vision, which includes the goals and our motivation to accomplish this study. It reflects the main focus of the work and the borders we have set. We have established four hypotheses related to the system. This chapter explains, which of these four hypotheses has been centered. The choice of methods and people involved in this project are based on this seminal decision.

## 1.1 Context

Cisco develops and provides equipment (such as routers, switches, etc) used to build and operate networks. More recently, software agents within the firmware of this equipment have been able to periodically send status and configuration details via internet to cisco.com. Today, the resulting alerts, evaluations and recommendations can be accessed by network operators in tabular form via HTML/browser.

In the future, the information shall be presented and used in a variety of ways and potentially be accessible in other ways than via HTML/browser. (see [www.cisco.com/go/smartcall](http://www.cisco.com/go/smartcall)).

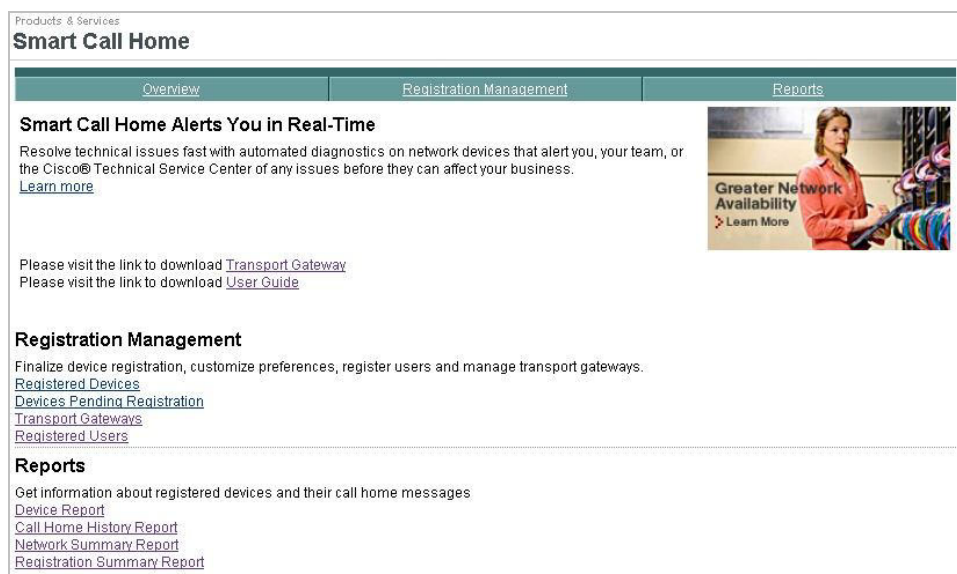


Figure 1 – Overview Page of Existing Smart Call Home Web Application

## 1.2 Goals

Based on an analysis of motivation, context and profile of users the project documents known (suspected) scenarios from the user's point of view and identify possible new scenarios. New scenarios based on the use of current web technologies (such as wikis, rss, communities, netbooks, smart phones, mobile tags, etc.) shall be illustrated. Proposals regarding interaction design for new (or up-dated) scenarios shall be detailed.

Findings and results may be considered for future releases of Smart Call Home.

## 1.3 Motivation

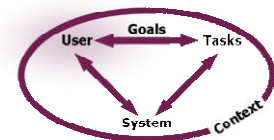
**Industry Partner:** fresh, independent view on users, scenarios and interaction de-sign possibilities.  
**Students:** ideal combination of real project/interest and enough freedom/independence to experiment with recently learnt methods.

## 1.4 Hypotheses

Four main hypotheses (H1 – H4) describe the wider area of interest around the Smart Call Home project.

### 1.4.1 Hypothesis H1 – Users

Customer-, Partner- or Cisco Staff in a range of different job roles and responsibilities can all be users of Smart Call Home. The skills, experience, responsibilities and goals of these users may vary.

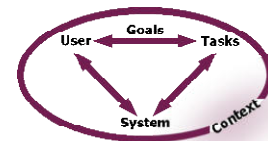


**Hypothesis:** The current interaction structure and concept accurately reflect the needs and wants of all Personas.

**Antithesis:** The current interaction structure and concept do not reflect the needs and wants of all Personas.

### 1.4.2 Hypothesis H2 – Context

Some features are used in normal office contexts while other features may be used in labs, on site, under stress, multi-tasking and with poor ambient conditions (light, noise, etc).



**Hypothesis:** The current interaction structure and concept accurately support system use within the relevant contexts.

**Antithesis:** The current interaction structure and concept do not accurately support system use within the relevant contexts.

### 1.4.3 Hypothesis H3 – Tasks

The current (June 2009) version of the Smart Call Home web application provides a given set of features. There may be additional responsibilities, goals, tasks or process steps, which could and should be supported.



**Hypothesis:** The current interaction structure and concept accurately support all relevant goals and tasks.

**Antithesis:** The current interaction structure and concept do not accurately support all relevant goals and tasks.

### 1.4.4 Hypothesis H4 – System

The current (June 2009) version of the Smart Call Home web application is built on a given architecture and set of technologies.

There may be additional, more appropriate interaction structures and concepts, which may require different architecture and/or technologies. (email, rss, sms/text, pager, wiki, beacon, redirect, ...)



**Hypothesis:** The architecture and set of technologies accurately represent all relevant interaction structures and concepts.

**Antithesis:** The architecture and set of technologies do not represent all relevant interaction structures and concepts.

## 1.5 Focus and Scope

Main Focus of the Project is Hypothesis H2. This has been selected from the wider area of interest, in order to satisfy the individual goals regarding:

- Project deliverables: (in-)validate one of the hypotheses H1-H4, document related Requirements Engineering and derive applicable Interaction Design and overall recommendations. Findings related to the other 3 hypotheses – which may emerge as a positive side effect – shall be documented as well.
- Scientific contribution: within the main hypothesis chosen as project deliverable, one or more specific aspects should be scientifically analyzed and discussed.  
Candidate: the influence of stress and multi-tasking on user interaction, or similar.
- Methods applied: the methods chosen support project deliverables and/or scientific contribution or may be chosen to experiment with newly learnt methods.  
Candidates: Interview, Contextual Inquiry, Personas, Moodboard, Card Sorting, Mental Model, Group Task Analysis, Needs Analysis, Storyboard, Wireframe, Hallway Testing, Experimental Verification, ...
- Student's objectives: ability to experiment with recently learnt methods in the context of a real project. Combine well-known HCID methods and scientific contribution to produce relevant deliverables.

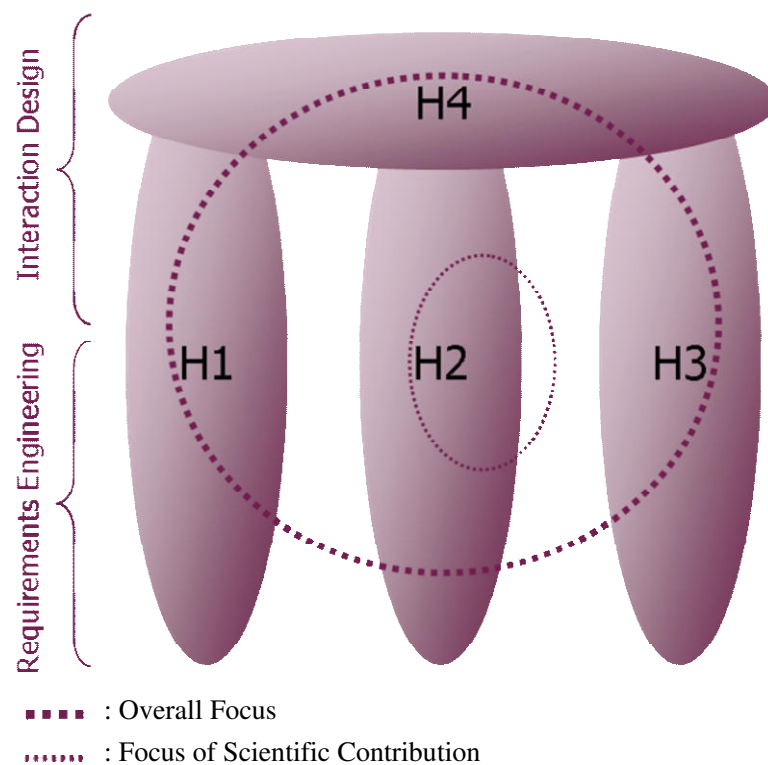


Figure 2 – Hypotheses and Focus

At the beginning of the project, the following aspects are explicitly known as in-scope or out-of-scope:

In Scope:

- RE and ID phases up to early Prototyping phases
- Primary and (subset of) secondary Personas
- Project report and presentations

Out of Scope:

- Software development and transition into production
- Culture, I18N and L10N related issues beyond Swiss diversity or occasional international users
- Generalization beyond the characteristics of this project

## 2 Background

### In This Chapter

Before we address the modality of applying requirements engineering methods, we would like to introduce you to the two main terms of this study – Smart Call Home and stress. You will receive valuable background information to ease the understanding of terms and concepts used and described in the following chapters. This chapter explains the concept of Smart Call Home in a simplified model and dwells on the short- and long-term effects of stress in general and on the job.

### 2.1 Concept of Smart Call Home

Cisco develops and provides equipment (such as routers, switches, access points, computing, etc) used to build and operate networks. As business relies on these networks, availability and integrity of the network becomes a key factor. Cisco Smart Call Home is a network diagnostic system based on a combination of functionality inside the network and services provided by Cisco.

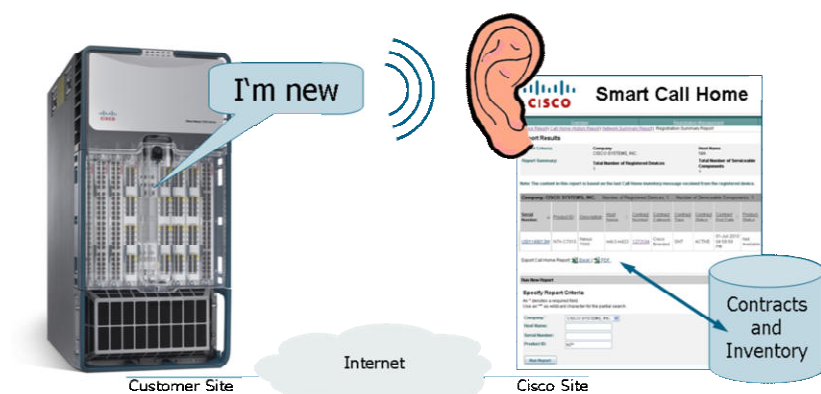


Figure 3 – Registering New Network Equipment

Customers can configure their network equipment to register itself with Smart Call Home. Provided the appropriate support contracts are in place, Smart Call Home will maintain an inventory of the device and accept future incoming messages from that device. Incoming messages will be processed and may trigger various actions such as generating email notifications or opening a request with Cisco support.



Figure 4 – Processing Incoming Messages

Traditionally, the owner or operator of a network ensures its availability and integrity through suitable processes and organizational structures. A combination of element management systems (EMS), network-management systems (NMS) or Service Management Systems (SMS) are often used to support the processes of the so-called network operations center (NOC). Skilled network operations staff are then backed-up with vendor support for technical escalation and support services. While this model is widely accepted and adopted, it heavily relies on the skill and experience of the operational and engineering staff. Very often it is also limited to reactive mitigation and remedial activities triggered by incidents. Finally, due to the rapid adoption of new technology and features, the skills, processes and management systems often lag behind the capabilities of the network infrastructure. These factors have a negative impact on network availability and integrity as well as on the operational work load.

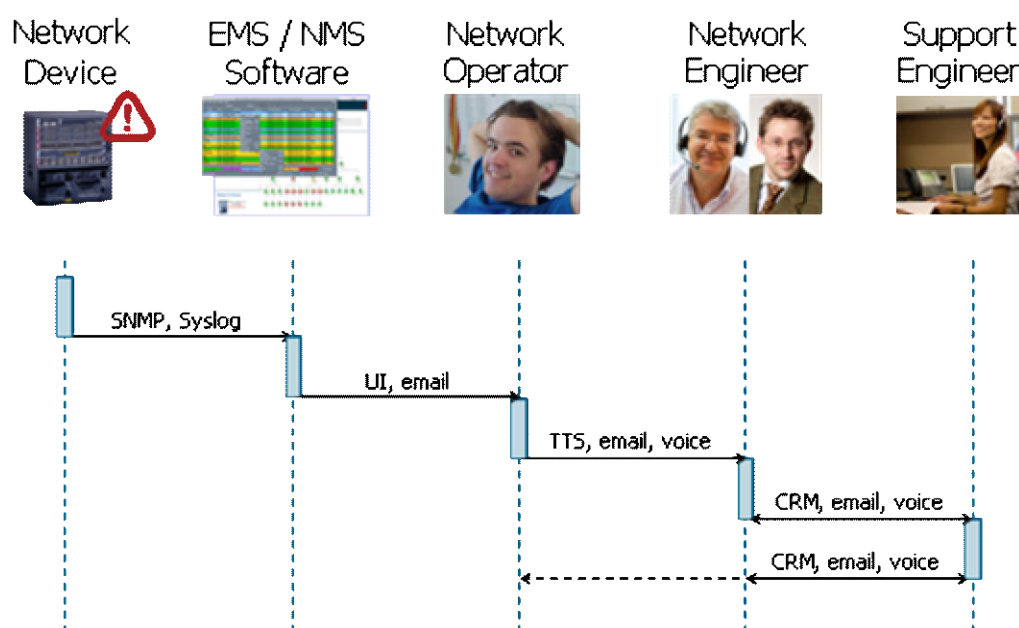


Figure 5 – Typical Flow of Information upon Network Device Incident – without Smart Call Home

Smart Call Home complements the traditional model. It aims to reduce some of the limitations and shortcomings of the traditional model by enabling automated analysis of information from within the network. The main components of Smart Call Home are:

- **Network equipment:** devices and firmware supporting the Smart Call Home agent can be configured by the owner to send Smart Call Home messages to the backend on Cisco.com. Enrollment of new devices has to be confirmed after the first message is received and may be subject to entitlement based on a support contract. The types of messages sent and the information shared can be configured by the owner.
- **Transport gateway:** very often network equipment does not have direct management connectivity to the internet. If so, one possibility is to relay Smart Call Home messages via the transport gateway. Another approach is to relay Smart Call Home messages via a (often dedicated) email infrastructure using SMTP and either IMAP or POP protocols. Transport gateway and email based approaches can also be combined to overcome connectivity restrictions in compliance with the owner's information security policies.
- **Backend on Cisco.com:** the backend on Cisco.com evaluates incoming Smart Call Home messages, derives recommendations and advisories and complements them with additional

information relevant to the respective device and firmware. The backend can also be configured to trigger automated actions such as opening a service request automatically or sending notification emails.

- Smart Call Home web application on Cisco.com: messages and the results of their processing in the backend are interfaced with the users via the web application. The web application also provides reporting, administrative and export functionalities.

Products & Services

### Smart Call Home

Overview | Registration Management | Reports

Device Report | Call Home History Report | Global Summary Report | Registration Summary Report | Service Request Logging Report

#### Device Report Results

Report Criteria: Company **FOXCORP**

| Serial Number                           | Host Name           | Description                                       | Company Name | Product ID  | HW Version | SW Version   | Part Number/Rev | Inventory Updated       | Configuration Updated   |
|-----------------------------------------|---------------------|---------------------------------------------------|--------------|-------------|------------|--------------|-----------------|-------------------------|-------------------------|
| <a href="#">FOX074500NB</a><br>Advisory | sjc5-row50n-san-sw1 | MDS 1 Slot Chassis                                | FOXCORP      | DS-C9120-K9 | 2.0        | 2.0(1b)      | 00-0000-0000    | 02-Dec-2009 03:56:30 PM | Not Available           |
| <a href="#">FOX114806PM</a><br>Advisory | AR                  | Cisco Systems Cisco 7600 9-slot Chassis System    | FOXCORP      | CISCO7609   | 1.2        | 12.2(33)SRC3 | 73-7360-05A0    | 22-Nov-2009 06:35:08 PM | 21-Oct-2009 09:21:52 PM |
| <a href="#">SAL10403K9L</a><br>Advisory | svlhw-11-sw1        | Cisco Systems Catalyst 6500 6-slot Chassis System | FOXCORP      | WS-C6506-E  | 1.1        | 12.2(33)SX01 | 73-9370-04A0    | 29-Oct-2009 11:00:00 PM | 29-Oct-2009 11:00:00 PM |
| <a href="#">FOX110102K5</a><br>Advisory | svlhw-00-gw1        | Cisco Systems Cisco 6500 4-slot Chassis System    | FOXCORP      | WS-C6504-E  | 2.0        | 12.2(33)SX01 | 73-9789-02A0    | 28-Oct-2009 11:00:00 PM | 05-Dec-2009 11:00:00 PM |
| <a href="#">FOX10520JC1</a><br>Advisory | svlhw-00-gw1        | Cisco Systems Cisco 6500 4-slot Chassis System    | FOXCORP      | WS-C6504-E  | 2.0        | 12.2(33)SX01 | 73-9789-02A0    | 28-Oct-2009 11:00:00 PM | 05-Dec-2009 11:00:00 PM |
| <a href="#">FOX071005TJ</a><br>Advisory | rch-mds1            | Not Available                                     | FOXCORP      | DS-C9216-K9 | 1.0        | 3.3(3)       | 73-8294-02      | 03-Oct-2009 11:06:41 AM | Not Available           |

113 items found, displaying 46 to 60.  
[First](#) [Prev](#) 1, 2, 3, 4, 5, 6, 7, 8 [Next](#) [Last](#)

Export Call Home Report: [Excel](#) | [PDF](#)

#### Run New Report

An \* denotes a required field.  
 Use an "\*" as wildcard character for the partial search.

Company\*:

Host Name:

Serial Number:

Product ID:

Include only devices with Product Advisory information: ☐

Figure 6 – Typical Report Screen of Smart Call Home Web Application

Based on these components different flows of information upon hardware incidents can be implemented. This can shorten the time needed for problem-solving and reduce the work load of both the network operator as well as Cisco support.

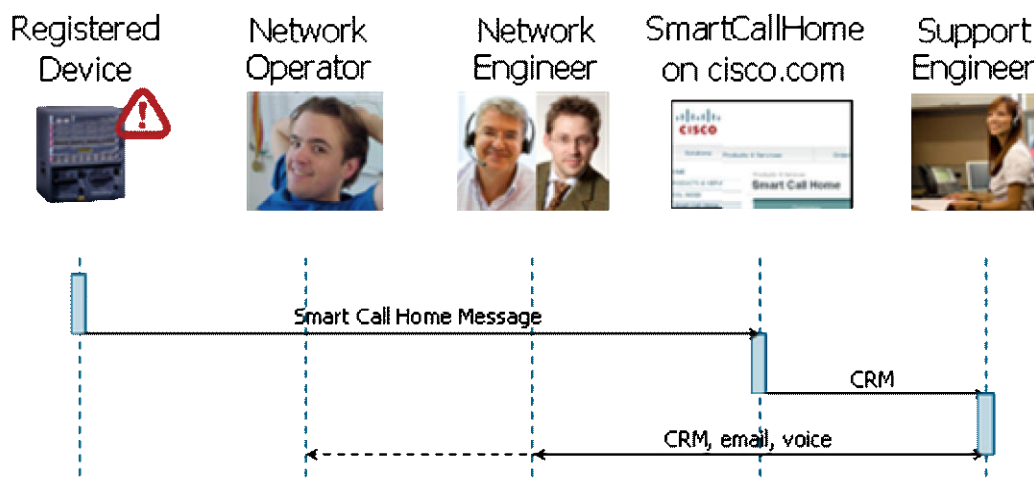


Figure 7 – Typical Flow of Information upon Network Device Incident – with Smart Call Home

There are several different Smart Call Home message types, which can be enabled selectively to either be sent periodically or upon specific events:

- **Inventory Messages:** carry information about a device's hardware inventory (such as chassis, modules, line cards etc.) as well as hardware and software version information. Full messages can be sent periodically and delta messages can be sent upon a hardware change during operation, for example when an online insertion or removal (OIR) activity occurs.
- **Configuration Messages:** carry information about hardware and software version as well as full running configuration and startup configuration. Sensitive information such as passwords are removed from the transmitted data. Full messages can be sent periodically and delta messages can be sent upon a configuration event (exit configuration mode) or a device reboot, which affects the running configuration.
- **Diagnostic Messages:** carry information about hardware and software version as well as about the diagnostic failure to trigger the message. A diagnostic message can either be sent manually or is triggered when a threshold number of consecutive failures are detected by a device's generic online diagnostic (GOLD) agent.

Products & Services

Smart Call Home

|                                                                                                                                                                |                         |         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------|
| Overview                                                                                                                                                       | Registration Management | Reports |
| <a href="#">Device Report</a>   <a href="#">Call Home History Report</a>   <a href="#">Global Summary Report</a>   <a href="#">Registration Summary Report</a> |                         |         |
| <a href="#">← Back to Report Results</a>                                                                                                                       |                         |         |

Message Details

|          |                                                                                                                   |                                                                     |
|----------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| Message: | Company<br>610856247 for USI1149012H                                                                              | Generated on device at<br>04-Jan-2007 06:07:43 AM (Local Time Zone) |
|          | Hostname<br><a href="#">Prod_-Cat6503-01</a>                                                                      | Processed by Smart Call Home at<br>01-Mar-2009 10:36:29 AM(PST)     |
|          | Message Name<br>Diagnostic<br><a href="#">View Message Header &gt;</a><br><a href="#">View Device Output &gt;</a> |                                                                     |

Overall Results within Analysis Period

| Service Request                           | Technology | Sub-Technology                         | Problem Code     |
|-------------------------------------------|------------|----------------------------------------|------------------|
| <a href="#">610856247</a> for USI1149012H | Other      | Smart Call Home Demo Only - Do Not Use | HARDWARE_FAILURE |

**Problem Details**

WS-C6509-E with Host Name Prod\_-Cat6503-01 and Supervisor WS-SUP720-3BXL reported GOLD Diagnostics test failure:

TestL3VlanMet on module WS-X6548-RJ-45 in slot 2 in USI1149012H  
TestIngressSpan on module WS-X6548-RJ-45 in slot 2 in USI1149012H  
TestEgressSpan on module WS-X6548-RJ-45 in slot 2 in USI1149012H  
TestFirmwareDiagStatus on module WS-X6548-RJ-45 in slot 2 in USI1149012H  
TestLoopback on module WS-X6548-RJ-45 in slot 2 in USI1149012H

**Recommendation**

There were multiple test failures in module 2 that very possibly have a single root cause. Take the following steps to resolve the failure:

- Multiple test failures in module 2. This indicates either a faulty module or a module that is incorrectly seated.
- Reseat module 2 firmly and make sure the screws are securely tightened.
- Move the module to a known good working slot on the same chassis or a different chassis. If the module passes the test in a different chassis could indicate a faulty chassis or a module that is inserting an indirect fault.
- Rerun the test using the 'diagnostic start' command to ensure that the test continues to fail.
- If the problem continues to occur, replace module 2

The recommendation for each individual test failure is listed in the individual result below in case further troubleshooting is required.

Individual Results within Analysis Period

| Device      | Test Name                    | Recommendation                      | Count | Status  |
|-------------|------------------------------|-------------------------------------|-------|---------|
| USI1149012H | TestLoopback                 |                                     | 1     | Failure |
|             | <a href="#">Show Details</a> | <a href="#">Show Recommendation</a> |       |         |
| USI1149012H | TestL3VlanMet                |                                     | 1     | Failure |
|             | <a href="#">Show Details</a> | <a href="#">Show Recommendation</a> |       |         |

Figure 8 – Typical Result of Post-Processing Multiple Diagnostic Messages

- **Environment Messages:** carry information about a device's environmental conditions (such as temperature levels or fan states) and power. These messages are triggered when a system related threshold is crossed.
- **Syslog Messages:** carry information about the Syslog configuration and logging history of a device. Syslog is a standard for forwarding log messages in an IP network.

- **Test Messages:** carry information about hardware and software version. These messages can be triggered manually from the network device for test purposes.

Availability and content of the above messages depend on the Smart Call Home configuration defined by the owner, the version of software, the type and model of devices as well as on the hardware and software configuration of the device. Since processing of messages on the Smart Call Home backend depends on various types and content elements of Smart Call Home messages, the availability of information and level of detail can vary greatly between registered devices.



Figure 9 – Devices Supported by Smart Call Home

From left to right, top to bottom: Cisco Catalyst 4500 Series Switches, Cisco Catalyst 4900 Switch, Cisco Catalyst 6500 Series Switches, Cisco 7200 Series Routers, Cisco 7600 Series Routers, Cisco Nexus 5000 Series Switches, Cisco Nexus 7000 Series Switches, Cisco MDS 9000 Series Multilayer Switches, Cisco Unified Computing System.

## 2.2 Effects of Stress on User Behavior

Our contribution to preempt or alleviate a Smart Call Home user from stress whilst interacting with the system is one of the main goals of this work. We believe the system can be optimized in several areas to give the user the greatest support possible to either prevent stress or minimize stress to the point where the user can act efficiently in stressed situations without getting lost in information or not gaining the information needed in the appropriate time. The stress initiators and contributing factors can vary in every person's life. Some of them though are known to affect many people and are probable to affect the Smart Call Home users. It is the main focus of this chapter to explain how users are affected by stress and what the reactions to stress regarding body and mind are.

### 2.2.1 Definition of Stress

Stress is the natural emotional and physical strain caused by our response to pressure from the outside world. The balance of body and mind is upset in some way. The word itself comes from the Latin language – “strictus” and means, translated, “dressed, tight or intent”. The meaning of the English word stress is “to

emphasize something or accentuate”: pressure, effort, burden, anxiety and affection<sup>[MF08]</sup>. In our language use nowadays the word stress is usually negatively coined. We associate it with negative sentiments and it usually describes the psychological strain felt.

Even though we use the word stress nowadays for an undesired situation in life, it does have positive aspects, which often go unnoticed until the phase is over. Stress can be a welcome condition in life that can push us to the limit now and then, which is good for our psychological and physical development<sup>[SM08]</sup>. It makes life tingly and exciting. The Hungarian-Canadian medical scientist Prof. Dr. Hans Selye, who brought the expression stress to our language, said ‘Stress is life’. Life without any stress is normally perceived as dull and monotone. During work or studies, we are often surprised how well we handle situations under stress, and with hindsight, when looking back, we ask ourselves ‘how did I manage all this’. We outgrow ourselves in such situations and are then often proud and relieved in the end.

Stress can also be life saving, for example when the body and the mind react to a sudden change that is considered to be life threatening. In such situations our body and mind gain strength and endurance, which we would never be able to develop in relaxed situations.

Physical and mental relaxing after the event only occur if stress is a temporary situation. A stress situation should be of rather short duration, followed by the easing of tension. If a human being is stressed over a longer period of time or stress is even normality in everyday life and there is insufficient time for relaxation, then illnesses and social problems are often the consequence<sup>[MF08]</sup>. This then leads to long-term effects, which can have destructive effects on our body and mind. In moments of stress, the influence of the cerebrum, which would be too slow for quick decisions, is decreased and decision patterns of the brain stem favored. Hormones such as are secreted. Noradrenalin alerts the brain, activates the energy reserves, increases the heart rate and supplies the muscles with more blood<sup>[MF08]</sup>. Serotonin is one of the most important hormones of our body. It gives high spirits, assertiveness, controls the eating behavior and the sexual drive, the sleep-awake rhythm and the sense of pain and temperature. This hormone is also secreted when eating such things as chocolate, which is the reason why chocolate is said to make people happy. As mentioned before, this hormone is secreted during stress phases to decrease stress and to relax body and mind. The secretion of these two hormones is very normal and important in both relaxed phases as well as under stress. The problem only starts, when serotonin is secreted over a longer period of time. Then the serotonin level is severely disturbed and it can even decrease. The consequence is that the natural protective shield breaks and the stress hormones are increased<sup>[MF08]</sup>. This hormone imbalance is the main reason for long-term effects, which in worst cases can lead to a burn-out syndrome, depression or heart attack. The short- and long-term effects are described in more detail in following chapters.

We cannot remove stress from our lives totally and as mentioned above this should not be the goal either. But we can learn how to handle stress and how to even prevent stress in some situations. There are some simple tips on how to minimize stress in our every day lives: Take small breaks after having completed a task. Try to plan your day in advance by noting the most important tasks that need to be done by the end of the day. Make realistic goals and keep in mind that you do not have to accomplish every task 100% satisfactorily. Set an end to your work after closing time – unfinished work is placed on the task list for the next day. Define boundaries and communicate these, say ‘no’ to tasks that are outside of your boundaries and that you cannot complete. Memorize how to prevent mistakes or wrong decisions in future rather than dwell on them. Use spare time for physical activities to get away from it all and re-energize. And last but not least, think positively<sup>[MF08]</sup>. These are just some of many tips used to prevent stress. Some people apply these tips naturally and automatically; others even need to force themselves to take breaks during their schedule. Every human being feels pressure from outside differently, some get stressed very quickly, some can resist pressure easily and do not get stressed when other people are already feeling the symptoms of

short-term stress. Everyone has to find his or her own way to deal with stress. In general, the more often someone is exposed to short stress periods, the better he or she will be able to handle these situations.

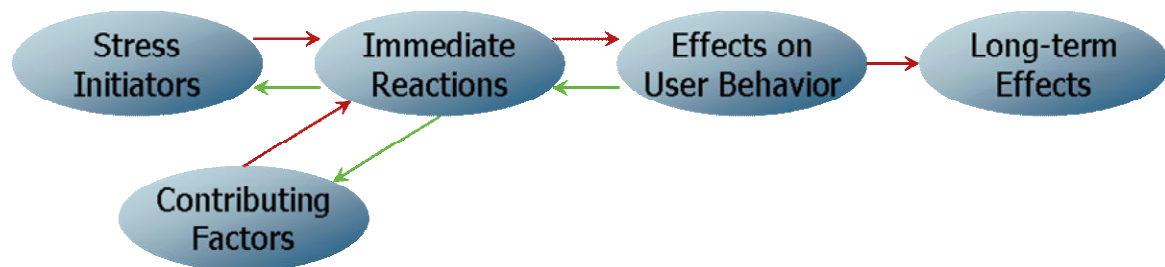


Figure 10 – Simplified Model of Stress

Based on the above background research we have chosen a simplified model of stress to further explore the relevant aspects within the context of our project.

### 2.2.2 Stress Initiators – Stressors

An event, experience, condition or other stimulus that causes stress is called a stressor. Stressors can be internal or external to the human individual. Typical external stressors are dehydration, inadequate nutrition, drugs, nicotine, electromagnetic radiation, the social and professional network or poor working conditions. Typical internal stressors can be emotional reactions to events such as marriage or birth, phobia, pressure to perform or illnesses. All these stressors can initiate stress. Some stressors are general stressors, which cause stress for nearly everyone whereas other stressors such as darkness, traveling, moving apartments or having lunch with the manager do not necessarily initiate stress. What can be a stressor today can be a very welcome event in the future. We tend to react calmly in situations, which are common. Presenting in front of a big audience can possibly trigger lots of stress at first but can also be joyful if it becomes a routine.

For a system such as Smart Call Home we expect many of the stress initiators to be external to the system itself. However, knowing the relevant stress initiators helps to design the system in a way that it does not accidentally trigger a stress initiator. In some cases added functionality can be considered to remove a stress initiator at least partially.

### 2.2.3 Contributing Factors

In times of stress, no matter if the stressor is internal or external, contributing factors can possibly show up, aggravating stress and producing even more pressure on our body and mind. Contributing factors can be negligible and do not initiate stress in relaxed situations. Not finding the correct phone number at once, working with a flickering display, a colleague making a joke, kids running around the house or having to wait to place an order at the restaurant normally cause no problem. But if stress has already been initiated through internal or external stressors, contributing factors aggravate stress and in some situations this can even be the last straw.

When designing Smart Call Home, our aim should be to work against the contributing factors to alleviate the negative effects.

### 2.2.4 Immediate Reactions

There are two different responses to stress. The positive response includes quicker thoughts, quick judgment, better ability to respond and better eyesight. If stress induces negative feelings, the responses are not very helpful towards rational and controlled execution of critical tasks. The immediate reactions are

increased heartbeat, discoloration of the skin, fear, tunnel vision, mental leaps, forgetfulness, inefficiency and blackouts. The more you get familiar with a situation, the more you are able to overcome and control these reactions. You will gain more confidence and become superior.

### 2.2.5 Effects on User Behavior

The immediate reactions of short-term stress have an effect on user behavior. Reactions such as fear, tunnel vision, inefficiency or nerviness constrict the usage of an application. In these situations, the structure of an application, the amount of information displayed and the presentation of the information have a great impact on the efficiency of a user. An application with a good concept and a user-centered design has a greater user acceptance and will assist in relaxed as well as stressful situations.

### 2.2.6 Long-term Effects

If stress affects you over a longer period of time and body and mind cannot relax enough, long-term effects are the consequence. Unfortunately many people put up with long-lasting or perpetual stress periods. Recurring or continued similar stressors often originate from professional and social life. This is a topic, which is emerging in the media, within companies and at schools more frequently. The discussion concerns the early detection, the effects on the human being and the long-term implications on the state. As mentioned earlier, the main problem of long-term stress is when the natural protective shield breaks, and the serotonin level decreases, good spirit fades and what normally boosts us and gets us going is absent. This may lead to psychological illnesses, which can even be life threatening<sup>[SM08]</sup>. Tiredness, lack of concentration, increasing aggression, feeling of helplessness, anxiety, depression, burnout and even suicidal thoughts are effects linked with long-term stress.

The impacts on the physical body are similarly grave. Under stress our body is prepared to protect itself, to react very quickly and to seek shelter as soon as possible. The muscles are filled with blood, our heart beats and our blood pressure is increased. To constantly have your body on alert wears it out, no matter what the stress factors or initiators are, the initiators do not even have to be life threatening. If stress is not decreased, an imbalance occurs, which leads to effects such as asthma, cardiac and circulatory troubles or negative effects on skin and digestion.

There are many possibilities to redress the balance. The pressure from outside has to be decreased in some way. Sometimes simple changes can help; sometimes a dramatic change in life is needed. Beneficially these changes are done before the long-term effects show or become permanent.

## 3 Methodology

### In This Chapter

This chapter outlines the specific steps followed to collect data in the area of the components of human-computer interaction - context, task, user and system. The steps performed are driven by our choice of methods, which are described in sufficient detail in order to replicate this study. You will read about the logical configuration of the methods, how they have been implemented and what role they play for the discussion of the hypothesis H2.

### 3.1 Project Approach

The approach for this project needs to include suitable methodology for four main areas: project management, requirements engineering, interaction design and dealing with stress.

For project management, the overarching model and iterative planning are adapted based on Rational Unified Process (RUP). Artifacts include a Gantt chart, Stakeholder list, Risk Management table and online time and activity reporting.

For requirements engineering and interaction design a relatively broad set of methodologies is used. This is due to two reasons. Smart Call Home is an existing application today, therefore actual and potential users are relatively well known, a user interface already exists and besides qualitative information also quantitative usage data is available. Hence several methods are required to benefit from these sources of information. Secondly, this master thesis is also a playfield for students who are eager to test methodology in a real-life environment. These methods and their use in the project are described in 3.2 **Requirements Engineering** and in 3.3 **Interaction Design**.

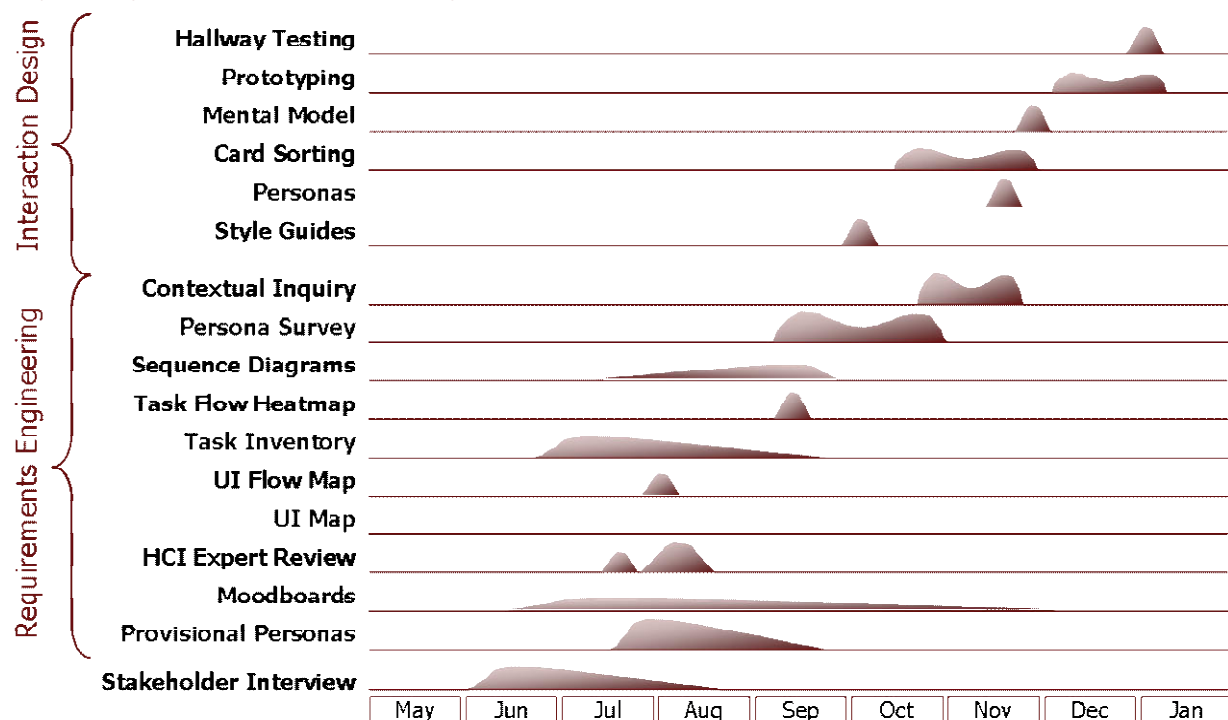


Figure 11 – Method Intensity over Time

For stress related aspects the project does not introduce a separate set of independent methodology. Requirements engineering and interaction design methods are enhanced and adapted to ensure effects of stress are an integral part throughout the project. This is described in more detail in 3.4 **Addressing Stress**. Having a common theme is key when combining disciplines from multiple fields and working on artifacts obtained from multiple methods. The selection and planning of methods is therefore designed in a way that ensures a logical flow through the project. Artifacts and work items are reused by subsequent methods. This is illustrated by Figure 11 – Method Intensity over Time.

### 3.1.1 Iteration Planning

Project planning ensures that time is properly allocated to succeed on the project. A realistic project plan helps to break down the project scope into smaller packages and tasks, which are easier to focus on and are easier to manage in time. A detailed project plan also shows the critical path. When a package or task is either postponed or exceeds the allocated time, it can produce bottlenecks and possibly affect the overall delivery time of the project. The project plan should contain at least the following elements:

- Phases
- Tasks to perform - start and end time
- At least one milestone per phase
- Timeline

Further detail, which can be added to a project plan

- Resources / Responsibility
- Artifacts
- Critical Path

#### 3.1.1.1 Relevance

The project plan helped us to stay focused on the project goal and to not drift off or perform tasks that were not manageable in the given time. Planning the tasks and methods was extremely motivating as we defined the set goals and the amount of time required by our methods would fit into the time scale. After discussing the project plan in our weekly meetings we felt a new drive to go on and accomplish what we had aimed for. By following the project plan and re-discussing it nearly every week, we increased our efficiency and our chance for success.

#### 3.1.1.2 External Milestones

The following milestones were defined prior to project kick-off:

- |   |            |                                                                  |
|---|------------|------------------------------------------------------------------|
| ☑ | 2009-05-02 | Thesis proposal presentation, selection and kick-off             |
| ☑ | 2009-06-01 | Thesis project request submission (signed by students and coach) |
| ☑ | 2009-09-05 | Mid-project presentation                                         |
| ☑ | 2010-01-31 | Final thesis report submission                                   |
| ☑ | 2010-02-20 | Final thesis defense presentation                                |
| ☑ | 2010-02-24 | Final thesis interview                                           |

#### 3.1.1.3 Implementation

Within the envelope provided by external milestones, we have chosen an iterative planning approach according to Rational Unified Process (RUP). The plan contains the four phases: conception, analysis, construction and delivery. While the project includes requirements engineering and interaction design,

there will not be an implementation of the redesign of the system within this project. Therefore the Transition phase is reduced to fit the project scope. The last task of this project will consist of presenting and reporting the findings and recommendations.

The plan contains the four phases of the RUP, the tasks performed, one milestone per phase and the time scale. We have allowed for requirements engineering to take up slightly more than half of the time. We believe we need tangible and comprehensive requirements to support the results regarding the thesis and advancements of Smart Call Home.

An important use of our time plan was to keep track of the time spent for requirements engineering. We could have accomplished more methods, interviewed more Stakeholders, sent the Survey to more people but we needed to stay on track with our time schedule and ensure enough time could be allocated to the design phase, which contains the evaluation and the conclusion, the actual results of this project. The following high-level Gantt chart illustrates the partitioning into four phases.

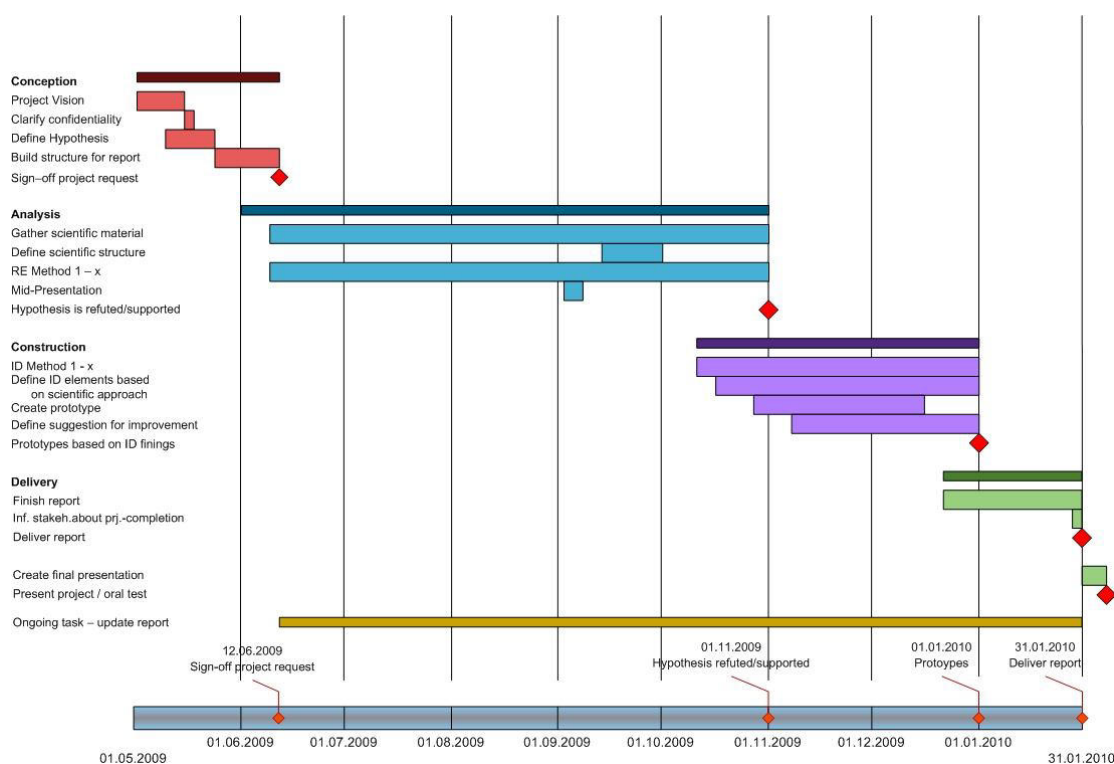


Figure 12 – High-level Gantt Chart

### 3.1.2 Risk Management

Risk Management uses tools and methods to cope with the risks a project has to deal with. It is all about identifying, evaluating and monitoring the risks. One of the methods of Risk Management is the risk list. This method already helps to minimize the risks, and it is relatively easy to create and very efficient. A risk list will easily satisfy the requirements of smaller projects. In larger and more complicated projects, a risk list will not stabilize the project enough. In this project the risk list is the main element of the Risk Management. Only project risks are managed, while product risks of Smart Call Home are disregarded. Figure 13 – Elements of Risk Management illustrates the elements of Risk Management, which are implemented using the Risk Management spreadsheet and periodic review.

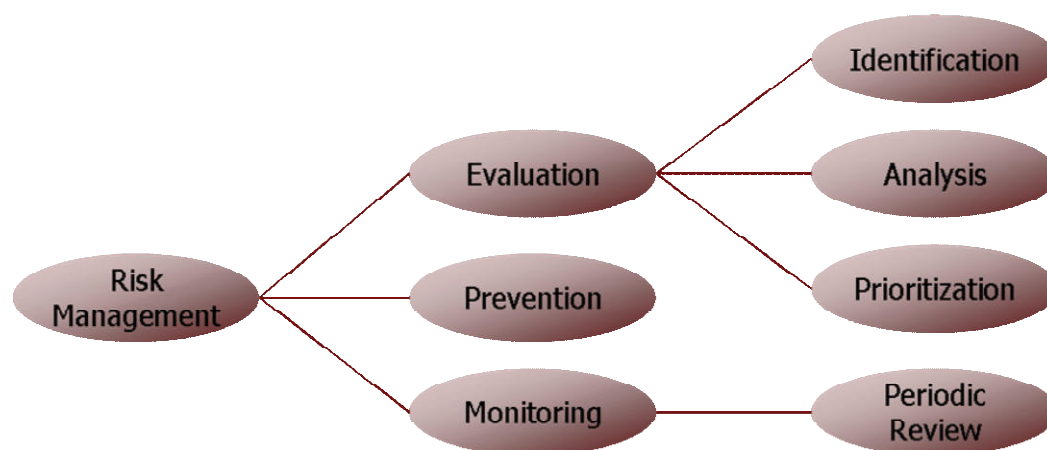


Figure 13 – Elements of Risk Management

### 3.1.2.1 Relevance

Setting up the risk list decreased the risks of the project. We were prepared for the major risks and therefore able to respond quicker to changes and occurrences. We knew at the start which risks were most likely to occur. This knowledge influenced our choice of methods as well as our project plan.

### 3.1.2.2 Implementation

We brain stormed all possible likely and unlikely risks. We then listed, analyzed and prioritized those which we believed to have a greater impact on the project. The priority of a risk depends on its probability and potential impact on the project. Remedial actions were defined to eliminate the risk or at least mitigate the impact. As a final step we defined the mitigation action, which was to be accomplished if a risk actually occurred. Unfortunately – but not surprisingly – we couldn't define remedial actions for all risks, as we do not have an influence on all eventualities.

The risk list was updated periodically, evaluating probability for each known risk and adjusting the list according to changed conditions. The figure below illustrates evolution of relative total risk during the project. To normalize the chart, the sum of all (impact x probability) values at project start was set to 1.

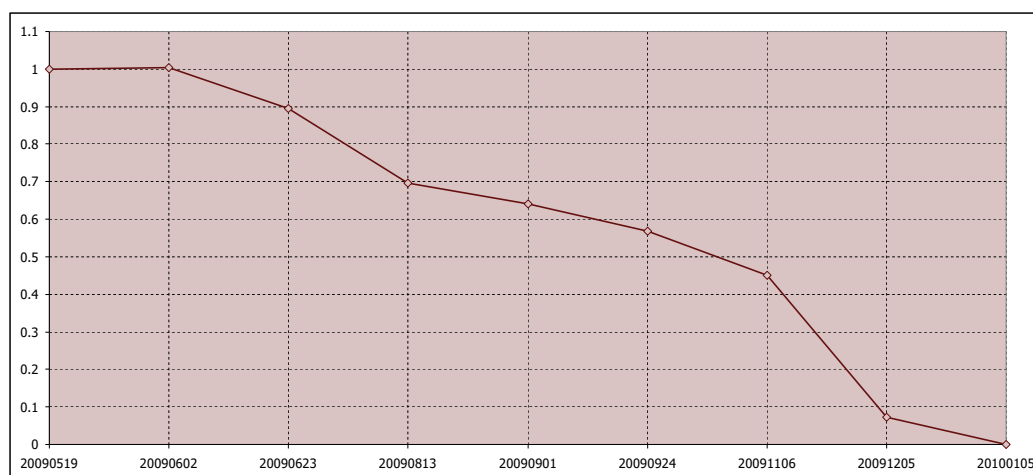


Figure 14 – Evolution of Relative Total Risk over Time

The full list of risks managed throughout the project, including the results of a periodic review, is available from Appendix III.a – Project Risks.

### 3.1.3 Stakeholders

There are a number of Stakeholders with an interest in Smart Call Home in general and/or in this study project in particular, some of them being users, some not. The Stakeholders listed are both internal and external to the project. Their relevance in the project and their influence on the project vary. Therefore every Stakeholder is analyzed according to his or her influence and relevance to ensure the correct acquaintance of every single Stakeholder. Analyzing these Stakeholders minimizes the risk of the project. Many projects have been buried because the influence of the Stakeholders was underestimated. Satisfied Stakeholders can very quickly become unhappy project players and can suddenly have a negative impact, which can even influence other Stakeholders. Therefore this analysis is part of the project development process and is accomplished several times throughout the period of the project. Even though at the time of the creation of the list the project investigations were already sophisticated, the list can still turn out to be incomplete during the course of the project and can thus be adjusted by adding Stakeholders not recognized before.

In contrast to other software projects, the Stakeholders for this project were not determined in order to manage or influence their attitude towards the system. The current system has a good reputation amongst the Stakeholders. The real reason to evaluate the Stakeholders for this project is because they may provide valuable information regarding the acceptance of the current state of the system, missing requirements and improvement opportunities. The different Stakeholders each provide different types of information. The Stakeholder list therefore also shows the different information carriers.

| ID   | Name                           | Description                                                                               | Responsibilities                                                                                         | Expectations                                                                                                |
|------|--------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| SH01 | Cisco Customer                 | User of Smart Call Home                                                                   | Share information about the use of the existing system.<br>Participate in Interview or Usability Testing | User-friendly system, satisfying needs and wants.<br>Minimal extra time contributed towards thesis project. |
| SH02 | Cisco Partner                  | User of Smart Call Home                                                                   | Share information about the use of the existing system.<br>Participate in Interview or Usability Testing | User-friendly system, satisfying needs and wants.<br>Minimal extra time contributed towards thesis project. |
| SH03 | Cisco Support Engineer         | User of Smart Call Home                                                                   | Share information about the use of the existing system.<br>Participate in Interview or Usability Testing | User-friendly system, satisfying needs and wants.<br>Minimal extra time contributed towards thesis project. |
| SH04 | Cisco Proactive Engineer       | User of Smart Call Home                                                                   | Share information about the use of the existing system.<br>Participate in Interview or Usability Testing | User-friendly system, satisfying needs and wants.<br>Minimal extra time contributed towards thesis project. |
| SH05 | Industry Partner (Tim Johnson) | Former Product Manager of Smart Call Home – acting as the industry partner for the thesis | Provides input, guidance and review to facilitate scoping and completion of thesis project               | Findings contributing towards improved user experience<br>Minimal extra time                                |

|      |                                           |                                                                                                                                                                                           |                                                                                                                                                                                                                          |                                                                                                                                                                                  |
|------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                           | project                                                                                                                                                                                   |                                                                                                                                                                                                                          | contributed towards thesis project                                                                                                                                               |
| SH06 | Industry Partner Product Team             | Own and develop the Smart Call Home product                                                                                                                                               | Provides input and review during the thesis project and may benefit from findings and recommendations                                                                                                                    | Minimal extra time contributed towards this thesis project                                                                                                                       |
| SH07 | Cisco Usability Engineering               | Own and evangelize corporate usability, experience and style guidelines                                                                                                                   | Provide relevant corporate usability and style guides                                                                                                                                                                    | No extra time contributed towards thesis project.                                                                                                                                |
| SH08 | Coach (Marcel Uhr)                        | HCID Expert, founder of soultank.ch, teaches within the MAS HCID curriculum.                                                                                                              | Coaches the project team to provoke thoughts and avoid fatal mistakes. Provides ongoing review and practical advice. Reviews and grades the thesis project                                                               | High quality thesis, focused and motivated students, benefit for industry partner                                                                                                |
| SH09 | Observer (Jacqueline Trachsler)           | HCID Expert, project support within MAS HCID curriculum                                                                                                                                   | Reviews and grades thesis report together with coach                                                                                                                                                                     | Readable, transparent and self-explaining report                                                                                                                                 |
| SH10 | Principal MAS HCID (Lothar Müller)        | Leads all MAS HCID curricula as the principal                                                                                                                                             | Sets guidelines and context for successful thesis completion. Resolves issues raised by coach or students. Reviews report and grading proposed by coach and observer                                                     | Motivated students, scientific contribution, high quality work in compliance with project proposal and MAS HCID guidelines                                                       |
| SH11 | Students (Bruno Klauser, Nadja Weisskopf) | Nadja and Bruno are completing the 3 year MAS HCID curriculum with this thesis project. Nadja works as an IT Manager for Lucerne Festival, Bruno works as a Consulting Engineer at Cisco. | Lead the thesis project to accomplish a high quality work, which meets the goals. communicate accurately, complete the project according to it's milestones, involve relevant Stakeholders and communicate appropriately | Apply the knowledge gained during the studies correctly, gain experience and self-confidence with HCID methodologies, collaborate efficiently with Stakeholders, work as a team. |

Table 1 – Stakeholder List

After the Stakeholder list is created, Stakeholder Interviews are held to gain an overview of the information every Stakeholder carries. This method is described in chapter 3.1.4 Stakeholder Interview. Further methods during requirements engineering and interaction design also partially rely on active Stakeholder contribution.

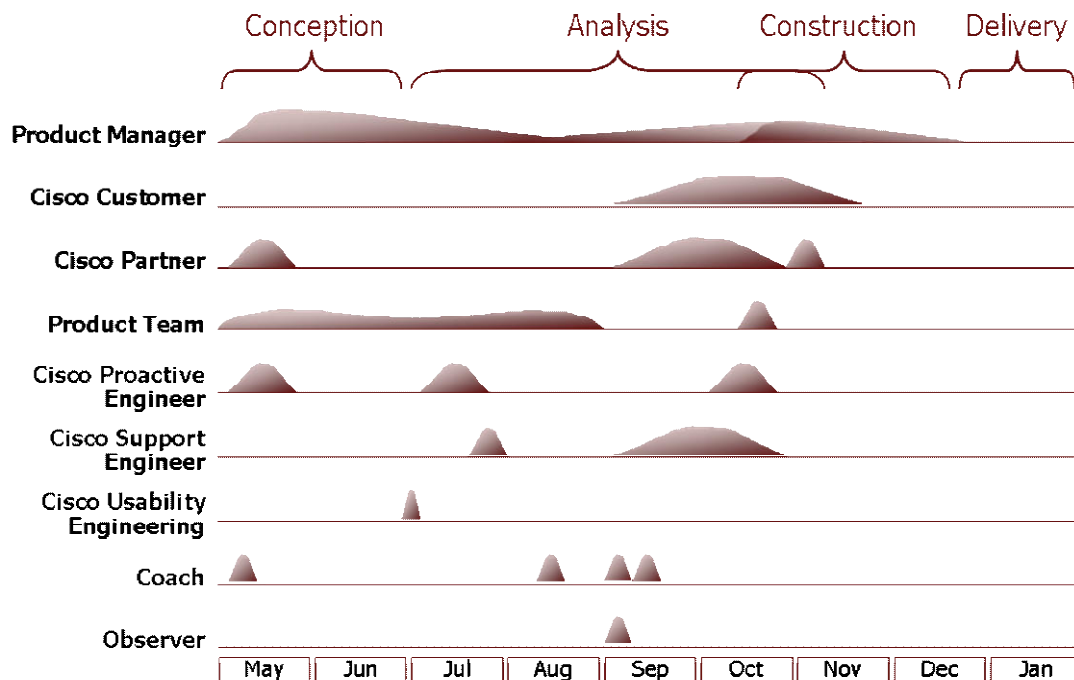


Figure 15 – Involvement of Stakeholders over Time

Current adopters of Smart Call Home, Stakeholders and contributors are distributed globally. Thus an exclusive focus on a small geographical area is to be avoided in order to reduce the impact of cultural or regional specifics, which may influence the outcome. This also means that some of the methodology implementation has to be suitable for remote participants.



Figure 16 – Geographical Distribution of Stakeholders and Contributors

### 3.1.4 Stakeholder Interview

Stakeholder Interviews are typically used very early in a project – even before the user research begins. It is a logical step after identifying the Stakeholders, which provides an insight into the business and technical context surrounding the system.

This interview type used shows the individual views of the Stakeholders, which give different perspectives of the system and the organization. All of the individual pictures together add up to a big picture, which gives a good first impression of the culture of the firm, the opinion of the Stakeholder, the context he or she is in and the problems he or she is dealing with. Apart from the project surroundings, this method also provides a reality check on the scope of the design effort and provides a decision point if a user research indicates a greater (or lesser) scope is required. Another important benefit of this method is the development of a common language and understanding throughout all involved groups.

The information to be gathered from Stakeholders includes:

- Product vision: Different Stakeholders may have their own perspective on the product or system.
- Reality check on the scope: Is greater or lesser scope required?
- Business drivers: Gain an understanding of what the different parties are trying to accomplish.
- Stakeholders' perception of the user: Gain important insights on users through Stakeholders who have relationships with users.
- Organizational view: Establish an understanding of the organization with respect to the project.
- Stakeholder's Context: Obtain a first level of understanding about a user's work context.

#### 3.1.4.1 Relevance

The Stakeholder Interview should give an impression on how the Stakeholders think about the product and the users. It should illustrate their thoughts, propositions, problems and attitude. It allowed us to inform them about the project schedule, and find out if they wish to be updated periodically and if they would be available for future questions. The necessity of a non-disclosure agreement had to be discussed in order to assure confidentiality. The interview introduced the Stakeholders to the project and could be perceived as the actual project start by the industry partner.

#### 3.1.4.2 Implementation

Our Stakeholders are spread across continents and time zones and some of them have busy work schedules making it difficult to schedule live conversation time within reasonable advance notice. Because of this, we decided to send questions and receive answers via email. While there was some initial doubt about the clarity and openness of questions, the answers provided proved that the questions had been understood correctly and had also provoked additional relevant comments. The Stakeholder Interviews consist of the following sections: Product Vision, Perceived SWOTs (S=Strength, W=Weakness, O=Opportunity, T=Threat), Roadmap, Style Guides, Usage Context and Personas.

We sent the Stakeholder Interview to three Stakeholders: the former and current product managers and the main user interface developer.

The information obtained via these Stakeholder Interviews contributed towards the selection and implementation of user centered requirements engineering methods. Methods such as Card Sorting or Remote Contextual Inquiry were selected specifically to answer questions raised during these Stakeholder Interviews. These methods also had to be implemented in a way that supported both face-to-face interactions and remote engagements to accommodate for the geographical distribution of Stakeholders.

## 3.2 Requirements Engineering

### 3.2.1 Provisional Personas

|                              |   |   |   |   |   |
|------------------------------|---|---|---|---|---|
| Contribution to Deliverables | ■ | ■ | ■ | ■ | ■ |
| Relevance to Hypothesis H2   | ■ | ■ | ■ | ■ | ■ |
| Effort to Implement          | ■ | ■ | ■ | ■ | ■ |
| Perceived Complexity         | ■ | ■ | ■ | ■ | ■ |
| Number of People Involved    | ■ | ■ | ■ | ■ | ■ |

Personas are archetypes of potential, typical users. The description contains the goals and observed behavior patterns in a way the Stakeholders, designers and developers can understand, remember and relate to. They are described using storytelling, which is thought to be more memorable than for example a list of findings. Storytelling engages the social and emotional aspects of our brain. To make the Personas even more memorable, each Persona is given an appropriate name and a photo.

*Provisional Personas* are Personas created in a very early stage of a project. They are created at a stage when not yet enough analysis has been done yet to create the actual Personas. The information on the users are still vague but nevertheless the silhouette can already be drawn. The Provisional Persona is adjusted later when the user analysis has been completed in-depth so that the actual Personas can be described.

#### 3.2.1.1 Relevance

Using Provisional Personas gets the team to deal with users at a very early stage, when precise user descriptions cannot yet be created. They encourage the team members to think about the same Persona, instead of each individual working towards his or her own vision of who the end user is. This artifact was a great help during project meetings to focus on the user needs and goals.

#### 3.2.1.2 Implementation

We have described the Provisional Personas just after accomplishing the first Stakeholder Interviews. The Stakeholder Interviews contained questions regarding the user groups, their behavior, their context and their exposure to Smart Call Home. The answers to those questions and additional free form answers revealed enough information to create a set of Provisional Personas. In a second round of Stakeholder Interviews we questioned the Provisional Personas. The answers that followed were used to update and consolidate the Provisional Personas.

### 3.2.2 Moodboards

|                              |   |   |   |   |   |
|------------------------------|---|---|---|---|---|
| Contribution to Deliverables | ■ | ■ | ■ | ■ | ■ |
| Relevance to Hypothesis H2   | ■ | ■ | ■ | ■ | ■ |
| Effort to Implement          | ■ | ■ | ■ | ■ | ■ |
| Perceived Complexity         | ■ | ■ | ■ | ■ | ■ |
| Number of People Involved    | ■ | ■ | ■ | ■ | ■ |

Users carry out tasks from within a given work context. As a consequence, a variety of context characteristics – such as location, environment, objects, ambient light, color, texture, mood, etc. – frame and influence the user's interaction with the system.

Moodboards are used in various formats such as paper cut and paste, electronic Moodboards, large posters including textures and 3d objects, and other formats suitable to capture and communicate moods.

### 3.2.2.1 Relevance

Moodboards are particularly important for this specific project, since the users:

- are employees of different companies,
- work in different types of organizations,
- have different roles and responsibilities,
- sometimes work in more than one typical work context (ie.: desk under normal conditions vs. production network site upon incidents and maintenance work).

Due to the above variety described above, there is an increased need to establish and communicate the differences and commonalities of these ambiances.

### 3.2.2.2 Implementation

For the purpose of this project, a combination of electronic Moodboards and group Moodboard session were chosen. Electronic Moodboards seem most appropriate since much of the contextual information is available electronically already and also since a good part of the ambience is electronic in nature: related websites consulted by the user, software interfaces and collateral.

In order to achieve a comprehensive set of Moodboards for the context in which the Personas perform Smart Call Home related tasks, the following approach is implemented:

1. establish basic understanding of Provisional Personas and contexts
2. each project member collects typical electronic photos/colors/drawings
3. images are merged on the respective Moodboards, images not supporting the overall ambience are dropped and gaps are filled with additional images
4. the resulting Moodboards are reviewed and refined in a short group session during the project meetings

The resulting Moodboards are an artifact, which is then included within the Provisional Persona and Persona descriptions.

### 3.2.3 HCI Expert Review

|                              |   |   |   |   |   |
|------------------------------|---|---|---|---|---|
| Contribution to Deliverables | ■ | ■ | ■ | ■ | ■ |
| Relevance to Hypothesis H2   | ■ | ■ | ■ | ■ | ■ |
| Effort to Implement          | ■ | ■ | ■ | ■ | ■ |
| Perceived Complexity         | ■ | ■ | ■ | ■ | ■ |
| Number of People Involved    | ■ | ■ | ■ | ■ | ■ |

A HCI Expert Review is a structured approach to capture usability feedback based on expert experience and heuristics such as those defined within ISO 9241<sup>[9241]</sup>. Unlike the empirical test, experts with limited product knowledge perform this heuristic test. The expert achieves valuable findings in a short period of time. Expert reviews are very popular in short projects with a high pressure on time. These tests are performed in a shorter time than usability tests where potential users are invited to a laboratory. If there is enough time, the best results are achieved if expert reviews are accomplished first, followed by usability tests, which complete the expert reviews.

Optimizations to the interface based on the expert review can positively affect usability at an early stage of the project already.

### 3.2.3.1 Relevance

Before even thinking about redesigning the application Smart Call Home, we wanted to test the application in an early stage of the project. Knowing our knowledge of the application was still very limited, we wanted to use a method intended for use when having limited product skills and designed to help understand the application and to get to know its limits and potentials. The relevance of the review was to become acquainted with the application and draw first conclusions relative to HCI and stress aspects.

### 3.2.3.2 Implementation

We performed the expert review after defining the scope and interviewing the first Stakeholders. We set goals and defined usability criteria beforehand, which gave us a direction when performing the tests.

| Goals                                                                                                                                                                                         | Criteria                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Gain overall impression of the application</li> <li>Uncover room for improvement</li> <li>Clarify open questions</li> <li>Note observations</li> </ul> | <ul style="list-style-type: none"> <li>Positive, neutral and negative HCI findings</li> <li>Consistency with defined style guides and surrounding Cisco.com elements</li> <li>Contributing factors to stress</li> </ul> |

Table 2 – HCI Expert Review Goals and Criteria

Every page and link was tested according to the goals and usability criteria defined. The outcome of our expert review can be found in Appendix IV.d – HCI Expert Review. Findings are listed and sorted according to the application area they relate to.

### 3.2.4 User Interface Map

|                              |           |
|------------------------------|-----------|
| Contribution to Deliverables | ■ ■ ■ ■ ■ |
| Relevance to Hypothesis H2   | ■ ■ ■ ■ ■ |
| Effort to Implement          | ■ ■ ■ ■ ■ |
| Perceived Complexity         | ■ ■ ■ ■ ■ |
| Number of People Involved    | ■ ■ ■ ■ ■ |

This artifact provides a high-level overview of the user interface structure of an application. It shows the structure and its main interaction elements. This is a good method for gaining an overview of the functionalities and pages, which the application provides. For web applications, a User Interface Map typically illustrates the structure of individual web pages, which is similar to the well-known sitemaps.

#### 3.2.4.1 Relevance

By clearly illustrating the structure and pages of the existing application, the User Interface Map serves as a means to understand the depth, width and complexity of the system. If you are lost in a jungle of functionalities and pages of an application at first, the map helps you structure and organize the pages in your mind. It is an artifact, which is worth framing and placing on the wall until the project is completed. If questions to the pages or discussions to structure come up, it is always good to have the map by hand and be able to refer to it. By viewing the map periodically throughout the project, and discussing it on several occasions, the structure and user interface can be optimized.

### 3.2.4.2 Implementation

At an early stage of the project we created the UI Map including all pages of the application as well as key interfaces external to the web application (such as automated emails with direct links back into the web application). Creating this map helped to see overlaps and repetitions of pages and functionalities. This method can be used independently; it does not rely on other methods. We created the map during and after the expert review because we felt before going on with requirements engineering we had to know which complexity and which functionalities and pages we were dealing with. The map was one of the artifacts which accompanied us through the whole project. The map was discussed in nearly every project meeting. In these discussions we worked out structure optimizations, positioning of new elements and eliminated weaknesses.

Due to the limited size of the existing system, a manual approach to creating the User Interface Map – based on taking screenshots and structuring them using standard office applications – was most suitable. However, for bigger applications or if multiple versions exist, one would have to consider a (semi-) automated way of creating and maintaining the User Interface Map.

### 3.2.5 User Interface Flow Map

|                              |   |   |   |   |   |
|------------------------------|---|---|---|---|---|
| Contribution to Deliverables | ■ | ■ | ■ | ■ | ■ |
| Relevance to Hypothesis H2   | ■ | ■ | ■ | ■ | ■ |
| Effort to Implement          | ■ | ■ | ■ | ■ | ■ |
| Perceived Complexity         | ■ | ■ | ■ | ■ | ■ |
| Number of People Involved    | ■ | ■ | ■ | ■ | ■ |

A User Interface Flow Map enriches the User Interface Map by adding all possible navigation flows between the interaction elements. The paths a user can choose when exploring an application are shown by connecting the pages using arrows to indicate the direction of the flow. For web based applications, each element containing a link (ie.: buttons, links, image maps, etc) is represented within a flow

#### 3.2.5.1 Relevance

The method shows repetitions of flows, dead ends, dead pages, loops and unnecessary intermediate pages as well as long-winded flows and detours. Visualizing the User Interface Map and flows on a single diagram is an efficient tool for spotting inconsistencies in structure and weak areas of user interactions, which may be optimized.

It is also a good tool to spot and define reusable structural patterns, which can make it easier for users to anticipate the behavior of less frequently used application areas, based on experience from more frequently used ones.

#### 3.2.5.2 Implementation

As a logical next step after creating the UI Map, the UI Flow Map was implemented as an overlay to the existing UI Map. Once we had organized the pages of the application the flow needed to be visualized and optimized. Optimizations regarded pages, which were to be split, functionalities, which were missing, important information or functions, which were nested in sub-pages and user flows, which needed to be changed and rerouted to increase the efficiency.

Together with the Task Flow Heatmap, this method had the greatest potential for uncovering so-called quick wins – weaknesses and incremental optimizations, which would yield a significant improvement while not requiring fundamental structural changes.

### 3.2.6 Task Inventory

|                              |   |   |   |   |   |
|------------------------------|---|---|---|---|---|
| Contribution to Deliverables | ■ | ■ | ■ | ■ | ■ |
| Relevance to Hypothesis H2   | ■ | ■ | ■ | ■ | ■ |
| Effort to Implement          | ■ | ■ | ■ | ■ | ■ |
| Perceived Complexity         | ■ | ■ | ■ | ■ | ■ |
| Number of People Involved    | ■ | ■ | ■ | ■ | ■ |

When working with a system, users complete various tasks to fulfill their objectives. Tasks can be fully or partially supported by the system or even happen completely outside the system. Tasks can also be initiated by and interact with different users or elements of the system. The Task Inventory represents a structured overview of these tasks.

#### 3.2.6.1 Relevance

The list shows the above mentioned tasks, which helps the project members to gain an overview of tasks of the parties involved, including the system itself. The Task Inventory also holds tasks that are not part of the system but are accomplished by the Stakeholders before or after using the system. At a later stage these tasks may well be discussed to be made part of the system. Tasks accomplished by other systems need to be discussed. These tasks may well be missing in Smart Call Home today and their integration could potentially increase the efficiency of the Smart Call Home-user.

#### 3.2.6.2 Implementation

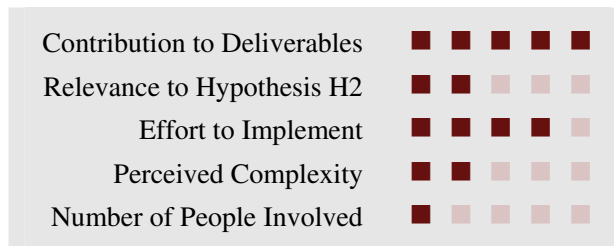
The Task Inventory is used to compare the tasks with the requirements and the user interface flows. This comparison gives information about which tasks are performed outside of Smart Call Home, which are performed using Smart Call Home and which other systems may be involved in addition to Smart Call Home. In particular the tasks not performed using Smart Call Home may indicate an opportunity to increase the efficiency of the user by integrating the tasks in Smart Call Home. The Task Inventory has been created in an early stage of the project and adjusted throughout. Feedback from the Stakeholder Interviews helped to complete the Task Inventory. The Stakeholders mentioned tasks considered to be missing in Smart Call Home or tasks performed in Smart Call Home, which we had not previously thought about.

A combination of two approaches was used to determine the tasks, the first one being more structured, the second in a more free format. The free format approach was based on a team brainstorming. The structured approach used the following steps:

- Deduced tasks from the UI Map
- Deduced tasks from the UI Flow Map
- Determined tasks by going through the Stakeholder List
- Determined tasks by performing Stakeholder Interviews
- Determined tasks by going through the entity list.

The more steps are chosen, the more complete the Task Inventory will be. We chose all five steps in the order listed above.

### 3.2.7 Task Flow Heatmap



Task Inventory and User Interface Flow Map provide an overview of the existing user tasks as well as the existing system. Combined, they also provide a sense of pages and paths of the existing system involved in completing specific tasks. However, since pages and paths of the system can be shared across multiple tasks they do not easily reveal the most prominent areas of an existing system overall. Therefore the Task Flow Heatmap – based on a combination of User Interface Map and statistical access data – is used to illustrate the pages most often viewed and the paths most often followed.

#### 3.2.7.1 Relevance

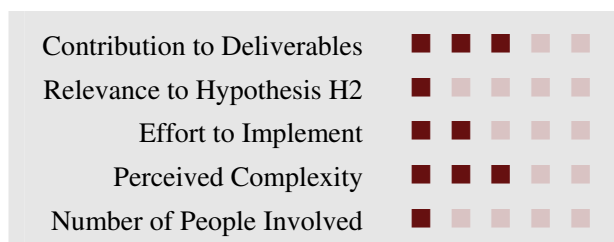
Most other methods deliver qualitative information about the behavior of a small number of selected users. The Task Flow Heatmap however is based on statistical data collected on the Smart Call Home server side. It can therefore complement the overall understanding by providing a global view across the complete active user base.

This information can be used to validate findings from other methods as well as to identify areas where UI structure may not be optimal for the actual use.

#### 3.2.7.2 Implementation

The server side logs of the Smart Call Home web application can be analyzed using web analytics base on Unica NetInsight<sup>[N109]</sup>. To ensure sufficient variety of input data while staying within reasonable processing time we've chosen to analyze a full month of access statistics. September 2009 will be used since it is well after introduction of the current release of the web application and includes few major holiday periods among most of the current user base. The UI Map can then be overlaid with page hit and path statistics obtained to form the Task Flow Heatmap.

### 3.2.8 Sequence Diagrams



This method is used to represent the message flow of a single task or use case. It makes the chronology of messages and interactions between the involved parties of a project or a system visible. The communication can take place between groups of people, individual people or a system. As the diagram shows, it is very easy to read and therefore normally has great acceptance amongst the project members. Often Unified Modeling Language (UML) of the Object Management Group (OMG) is used to create the diagram.

### 3.2.8.1 Relevance

Sequence Diagrams are intended to illustrate the most common message flows between the different parties involved. The team members should gain an understanding of the most important or most frequent scenarios. This helps establish a common and detailed view of the components and people communicating.

### 3.2.8.2 Implementation

While the Task Inventory was used to create a complete list of relevant tasks, only a subset of common tasks were selected to be detailed in the form of a Sequence Diagram. These sequences are also used in the Contextual Inquiries as task assignments to understand the current use and usability of the system. They are expected to be the most common use cases within Smart Call Home. This expectation is supported by the Task Flow Heatmap, which shows the amount of accesses to pages on Smart Call Home.

The Sequence Diagrams created use only a small variety of elements of those possible in UML to make the interactions between the mentioned parties visible. This allows not only technically versed people but also the business oriented Stakeholders to read these kinds of diagrams. In addition to engineering use of UML, UML based Sequence Diagrams can also effectively be used as a communication vehicle within a project – as illustrated by Grässle et al <sup>[GB04]</sup>. The Sequence Diagrams consist of the following elements:

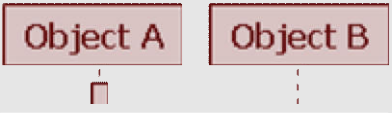
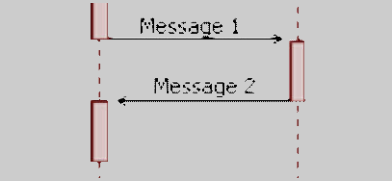
| Element      | Description                                                                                                                                                                            | Symbol                                                                                |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Object       | The parties or actors involved in the interactions are called objects and are situated on top of the diagram. They can be sender or receiver in the Sequence Diagram.                  |   |
| Message Flow | A Message Flow is indicated by a horizontal arrow between objects, with the direction of the arrow indicating the initiator and optionally with message details noted above the arrow. |  |
| Time Axis    | Time axes flow from top to bottom, and are indicated with dotted or dashed vertical lines below the objects.                                                                           |  |
| Control Flow | Bold sections of the time axis indicate the object(s) in control for a specific time period. Multiple objects in control indicate parallel activities.                                 |  |

Table 3 – Elements of Sequence Diagrams

As recommended by Grässler et al <sup>[GB04]</sup> we used the following checklist for implementing Sequence Diagrams:

- Define objects – which parties are involved?
- Define the initiator – who starts the interaction?
- Define the message flows – which messages are sent and received by the objects?
- Define the chronology of the messages
- Enhance with additional information – what else is important?
- Verify the sight – check the diagram on the whole

We noticed the hardest work is actually the very beginning – defining the objects. This is the framework of the whole diagram. After having defined the objects it is only a matter of time to define all different

sequences and messages. If you are entitled to creating complete Sequence Diagrams, which cover all interactions, enough time should be scheduled.

### 3.2.9 Survey

|                              |   |   |   |   |   |
|------------------------------|---|---|---|---|---|
| Contribution to Deliverables | ■ | ■ | ■ | ■ | ■ |
| Relevance to Hypothesis H2   | ■ | ■ | ■ | ■ | ■ |
| Effort to Implement          | ■ | ■ | ■ | ■ | ■ |
| Perceived Complexity         | ■ | ■ | ■ | ■ | ■ |
| Number of People Involved    | ■ | ■ | ■ | ■ | ■ |

A Survey is used to ask one or more people specific questions regarding a specific topic. Every question suits an exact purpose. The most important questions to ask yourself when creating a Survey are ‘what do we want to achieve with the Survey’ and ‘what do we want to achieve with the single question?’ Every Survey and question needs a purpose; otherwise the evaluation will not bring a benefit and potentially a second or third Survey iteration is needed.

#### 3.2.9.1 Relevance

The Survey method was chosen for two reasons. Firstly, amongst information gathered from other methods, it should complete and round off the Provisional Personas to eventually create the final Personas. Thus we sent the Survey to people potentially belonging to one of the four Provisional Persona groups and to actual Smart Call Home users. Secondly, the answers should help to support or refute hypothesis H2. The answers tell us more about the behavior of the user during normal and stressful situations. The participants provided an insight into the tools used, collaborations, the context and existing extractions and irritations during normal and stressful situations. Also an indication of perceived stress was obtained through a set of questions articulated according to the Perceived Stress Scale (PSS) methodology.

#### 3.2.9.2 Implementation

We chose to implement an online Survey accessible via standard web browsers for the following reasons:

- Our participants are spread across the world
- The online Survey is easy to use and self explanatory
- The answers are saved in a database
- The answers can be aggregated and exported easily
- It can be adjusted easily without resending the Survey
- A Survey flow to keep a certain order or skip questions based on prior answers can be implemented
- The answers can be treated confidentially

To create the Survey we used the tool SurveyMonkey (surveymonkey.com). SurveyMonkey is a cloud service that provides free licenses as well as two different kinds of commercial licenses. The licenses differ in maximum number of questions per Survey, number of participants per Survey and the service level. The commercial license provides 15 different question types, such as drop downs, text boxes, radio buttons or date fields. The tool provides a URL, which is sent to the participants by mail. Answers can be viewed online or exported as a file.

As mentioned above, one part of the focus was to gain information, which would either support or refute our thesis. The Survey included closed captioning question in the areas of distractions, engagements, tools

and collaboration as well as a tailored 5-item PSS Survey (see 3.4.1 **Perceived Stress Scale**). All questions were asked twice, once for each of the following situations:

- Situation 1: In the last month, how often have you been performing ongoing network administration and management?
- Situation 2: In the last month, how often have you been performing critical network troubleshooting or maintenance work?

The initial descriptions of the above situations included the words ‘potentially from your regular work place’ for situation 1 and ‘potentially on-site’ for situation 2. However it quickly became clear that these were misleading – therefore the situation descriptions were reduced as shown above and below.

Figure 17 – Online Survey based on SurveyMonkey

A full copy of the online Survey, all raw answers submitted as well as the Survey data evaluation are available from Appendix III.d – Survey.

### 3.2.10 Remote Contextual Inquiry

|                              |   |   |   |   |   |
|------------------------------|---|---|---|---|---|
| Contribution to Deliverables | ■ | ■ | ■ | ■ | ■ |
| Relevance to Hypothesis H2   | ■ | ■ | ■ | ■ | ■ |
| Effort to Implement          | ■ | ■ | ■ | ■ | ■ |
| Perceived Complexity         | ■ | ■ | ■ | ■ | ■ |
| Number of People Involved    | ■ | ■ | ■ | ■ | ■ |

Contextual Inquiry is a method which combines aspects of an interview and of observation – both taking place within the actual workplace of the user. The method was first described by Beyer and Holtzblatt<sup>[BH98]</sup> and since used and adapted in various formats and variations.

The strength of Contextual Inquiries lies in the richness of information that can be collected about a user’s natural behavior and work context. As a low invasive method it is suitable even in situations where users can not contribute significant extra time towards the user centered design

#### 3.2.10.1 Relevance

To complete our existing understanding based on other methods and to validate assumptions about current user behavior we needed to observe active users of the current Smart Call Home web application upon some typical tasks and from within their actual work environment. A very relevant part of such work environments are other tools and applications that the users may be using together with Smart Call Home.

### 3.2.10.2 Implementation

Due to the geographical distribution of suitable users it was not feasible for us to travel on-site and conduct traditional Contextual Inquiries. Furthermore most users are external to the industry partner and can only contribute little time towards the study project. Finally the use of Smart Call Home – even for the most active users – does not consume a significant percentage of any individual user's work time.

Therefore we implemented an approach based on an adapted variant of the Remote Contextual Inquiry as described by English and Rampoldi-Hnilo<sup>[ER04]</sup>. While English and Rampoldi-Hnilo's motivation for implementing RCI was slightly different, the method provided a perfect solution given our project's constraints and our main interest at this stage.

The tool used to implement the Remote Contextual Inquiry was Cisco WebEx, a rich media conferencing service of which we used the desktop and application sharing capabilities, video, voice conferencing, chat and recording functions. To ensure smooth Remote Contextual Inquiries we developed a Playbook as well as a Template to be used during the session, see Appendix III.e – Remote Contextual Inquiry Playbook and Appendix III.f – Remote Contextual Inquiry Template. The notes based on the template were then verified and completed after the session by using a playback of the recording.

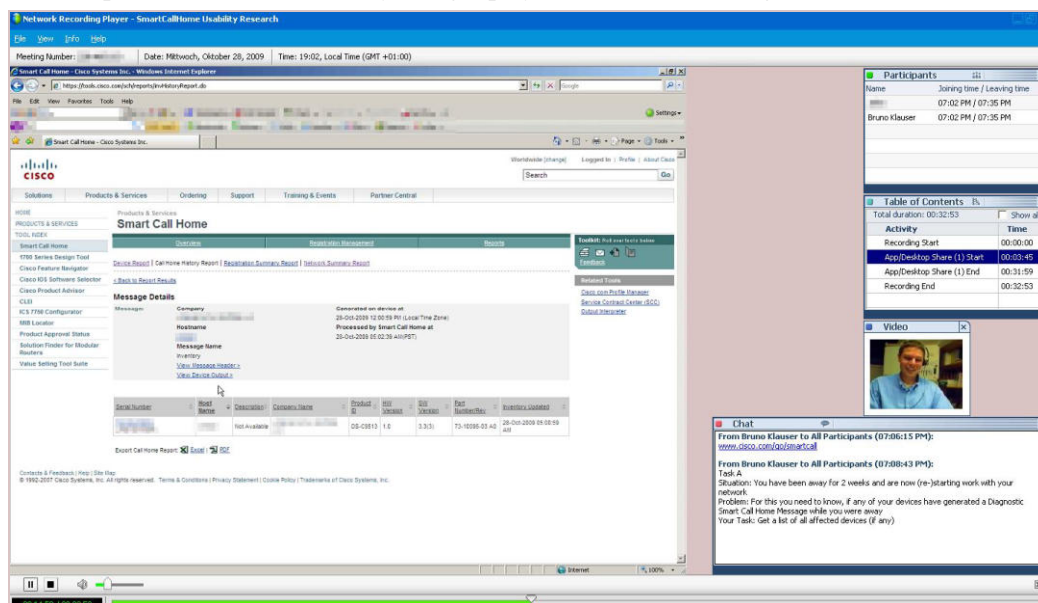


Figure 18 – Screenshot During a Remote Contextual Inquiry Using WebEx

## 3.3 Interaction Design

### 3.3.1 Existing Style Guides

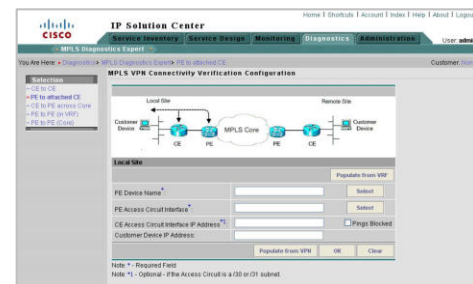
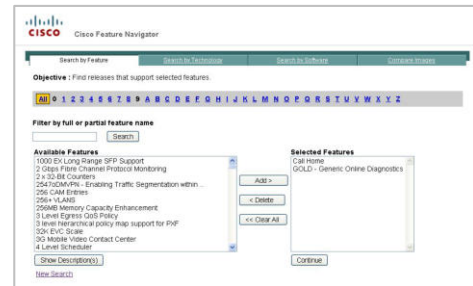
|                              |   |   |   |   |   |
|------------------------------|---|---|---|---|---|
| Contribution to Deliverables | ■ | ■ | ■ | ■ | ■ |
| Relevance to Hypothesis H2   | ■ | ■ | ■ | ■ | ■ |
| Effort to Implement          | ■ | ■ | ■ | ■ | ■ |
| Perceived Complexity         | ■ | ■ | ■ | ■ | ■ |
| Number of People Involved    | ■ | ■ | ■ | ■ | ■ |

Style guides ensure a consistent user experience when using a web site or application. They focus on presentational and behavioral aspects of the user interaction. Company specific style guides furthermore ensure consistency with corporate branding and identity.

There are a number of existing style guides and visual design rules within Cisco that could potentially apply to Smart Call Home:

- CAMP:** The tools.cisco.com guidelines for online tools define templates, APIs and design standards to provide consistency across the various dynamic tools within cisco.com. CAMP is designed to fit well with the overall style of Cisco.com. Typical examples implementing CAMP are Feature Navigator ([www.cisco.com/go/fn](http://www.cisco.com/go/fn)) or Software Download ([tools.cisco.com/support/downloads/](http://tools.cisco.com/support/downloads/)) tools.
- Picasso:** Provides application-level user interface and interaction guidelines for browser based interfaces. While it is still partially adopted by Cisco applications, it has now been superseded by Kubrick and is therefore not being considered for this project. Typical examples Implementing Picasso include MPLS Diagnostic Expert or IP Solution Center.
- Kubrick:** Are a collection of corporate Cisco User Experience (CUE) product standards and tools, which reflect Cisco's brand strategy and visual identity, and best practices for user experience design. These standards have been written to take accessibility and internationalization requirements into account. Guidelines, templates, libraries and a Prototyping toolkit are provided.
 

Note: Kubrick is still Cisco confidential at the time this report is being completed and has been provided to the project team under NDA only – therefore it cannot be included in detail in this public report or the public presentation.



### 3.3.1.1 Relevance

An analysis of the corporate style guides is relevant for two aspects of this project. During requirements engineering and understanding of the style guides helps to clarify whether a specific element of the existing application is consistent with the overall Cisco.com website. It also helps to understand degrees of freedom within the application versus predefined styles.

During interaction design style guides are essential to ensure prototypes and illustrations will be transferable into implementation in a consistent and efficient manner.

### 3.3.1.2 Implementation

The current Smart Call Home web application has been implemented based on CAMP. The current Smart Call Home Transport gateway uses a native user interface that does not follow a Cisco specific style guide. For the purpose of this project, we have chosen to use a combination of:

- CAMP for Prototyping, which is intended to illustrate incremental findings and recommendations which do not require major (re-)design of the existing interfaces
- Kubrick for hi-fi Prototyping, for Prototyping of new areas and for Prototyping related to possibly major changes in design in comparison to the current interface.

Kubrick was chosen for the latter for the following reasons:

- Application format: even though the Smart Call Home web application is delivered via Cisco.com, it is perceived and used by users, as if it were a separate application – often also in concert with other (Cisco) network management applications.
- Consistency: potentially Kubrick could be used for both the Smart Call Home web application as well as for the transport gateway, which would create consistency across user interfaces of Smart Call Home.
- Accessibility and I18N: Kubrick addresses both accessibility and internationalization aspects, which are a key aspect of enabling a diverse user population to use Smart Call Home – from within normal office contexts as well as upon on-site troubleshooting and maintenance activities.
- Prototyping Toolkit: Kubrick provides Prototyping templates and toolkit based on MS Visio, which simplified and accelerated the Prototyping phase of this project. Furthermore, for wireframe Prototyping there are Balsamiq elements available, which correspond to the Kubrick component definitions.

### 3.3.2 Personas

|                              |   |   |   |   |   |
|------------------------------|---|---|---|---|---|
| Contribution to Deliverables | ■ | ■ | ■ | ■ | ■ |
| Relevance to Hypothesis H2   | ■ | ■ | ■ | ■ | ■ |
| Effort to Implement          | ■ | ■ | ■ | ■ | ■ |
| Perceived Complexity         | ■ | ■ | ■ | ■ | ■ |
| Number of People Involved    | ■ | ■ | ■ | ■ | ■ |

Personas are archetypes of potential, typical users, created during interaction design. Based on artifacts created during Requirements Engineering they consolidate the foregoing Provisional Personas. The Persona description is more exact and a more adequate name and photo are assigned. The description contains the goals and observed behavior patterns among potential users. Like Provisional Personas, they are described using storytelling, which is thought to be more memorable than for example a list of findings. Storytelling engages the social and emotional aspects of our brain. To make the Personas even more memorable, each Persona is given an appropriate name and a photo.

Provisional Persona as a method is typically used when very early in the project there are already assumptions, prior work or ‘well-known facts’ about users available. Projects without this information typically use Personas as the first artifact to describe the user.

#### 3.3.2.1 Relevance

Personas help the entire product team understand what users and customers need. It is a great tool to bring the users and the Stakeholders closer together. A collective comprehension of the users helps during meetings, where each Persona serves as a surrogate for all the potential and existing users who have similar characteristics and goals. Especially when handing over the project to the Industry Partner, the Personas are intended to help the teams involved in further development to concentrate on the user and focus on user needs. In this project the Personas have an even greater benefit, as some of the Stakeholders

of the industry partner have just recently joined the Smart Call Home team and may not yet be fully familiar with the user's needs and characteristics.

### 3.3.2.2 Implementation

After completing user research, the needs and characteristics of a user were sufficiently well known to enhance the Provisional Personas with more detail. The Provisional Personas were also adjusted and real names as well as photographs instead of comics as placeholders were assigned. Making design decisions with a shared picture of "the user" in mind helped us stay focused on the user needs and goals. Comparison and description of Personas can be found in chapter 4.3.1 Personas.

### 3.3.3 Card Sorting

|                              |   |   |   |   |   |
|------------------------------|---|---|---|---|---|
| Contribution to Deliverables | ■ | ■ | ■ | ■ | ■ |
| Relevance to Hypothesis H2   | ■ | ■ | ■ | ■ | ■ |
| Effort to Implement          | ■ | ■ | ■ | ■ | ■ |
| Perceived Complexity         | ■ | ■ | ■ | ■ | ■ |
| Number of People Involved    | ■ | ■ | ■ | ■ | ■ |

Card Sorting is a user-centered design method which produces information structures. These structures reveal information about analogies and Mental Models intuitively utilized by the users. The findings of a Card Sorting can be used as suggestions and input when designing a user interface structure and choosing suitable interaction concepts. A more formal – yet still qualitative – handling of the results of a Card Sorting can lead to further insights about the user's so-called Mental Model.

There are two main variants of a Card Sorting:

- Open Card Sorting: in open Card Sorting, participants are free to create their own categories and structures in which to organize the individual topics
- Closed Card Sorting: in a closed Card Sorting, participants assign topics to a predetermined set of categories

Both variants are relatively cheap and quick to implement and evaluate.

#### 3.3.3.1 Relevance

The Card Sorting showed us missing or unclear terms of the application as well as the Mental Model of the potential and existing users. The Mental Model shows how users structure the terms, which is useful when discussing the structure, navigation and other sections of the application. The application can then be challenged and optimized, based on user-centered data.

#### 3.3.3.2 Implementation

Since our main interest was to find higher level analogies and structures we implemented an open Card Sorting. Participants were additionally allowed to discard or modify existing cards or even create new cards. We performed Card Sorting with potential users, existing users and ourselves. Where possible, Card Sorting was conducted face-to-face. Where this was not possible, Remote Card Sorting was implemented using a combination of email and Microsoft PowerPoint. The participants of the remote Card Sorting received a PowerPoint document containing four slides. The first slide contained brief initial instructions, the second slide contained 45 terms of the application which were to be structured, the third slide

contained instructions upon completion and the fourth slide provided a backup copy of the 45 terms, in case the user needed a clean copy.

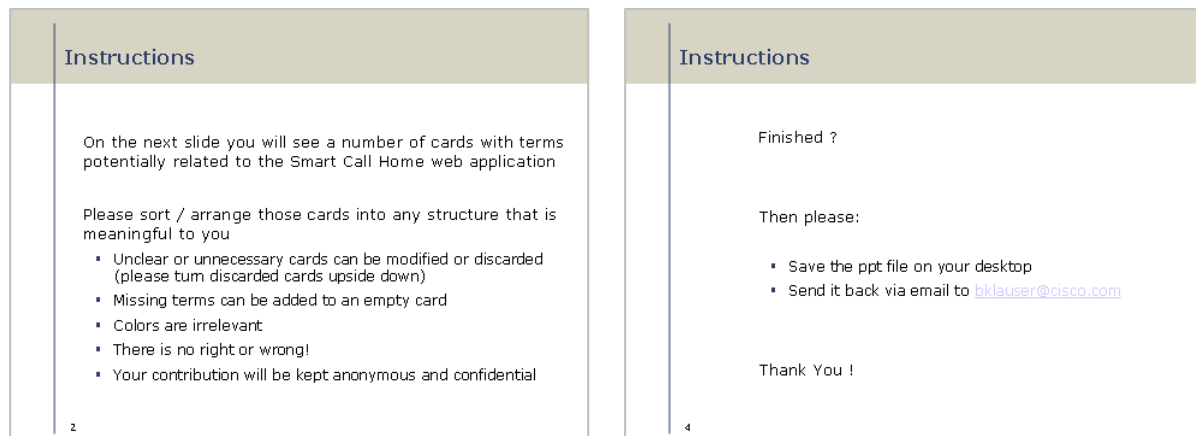


Figure 19 – Remote Card Sorting Instructions

The face-to-face Card Sorting was performed in a meeting room or neutral location with one or two project members accompanying the task. The time needed varied from 10 minutes to 45 minutes. We took photos of the results and later recreated the results in PowerPoint for further evaluation. Any questions raised or, comments made were also captured in PowerPoint.

The resulting structures can be found in Appendix IV.k – Card Sortings.

### 3.3.4 Mental Model

|                              |   |   |   |   |   |
|------------------------------|---|---|---|---|---|
| Contribution to Deliverables | ■ | ■ | ■ | ■ | ■ |
| Relevance to Hypothesis H2   | ■ | ■ | ■ | ■ | ■ |
| Effort to Implement          | ■ | ■ | ■ | ■ | ■ |
| Perceived Complexity         | ■ | ■ | ■ | ■ | ■ |
| Number of People Involved    | ■ | ■ | ■ | ■ | ■ |

As described by Young <sup>[Y108]</sup>, Mental Models are an effective tool to capture analogies and motivations that influence behavior as well as the behavior itself. Data required to derive Mental Models can be obtained using various different methods, such as Interviews, Observations, Contextual Inquiries, Usability Tests or Card Sorting. A Mental Model can be represented in Affinity-, Hierarchy- or so-called long-horizon diagrams. An individual Mental Model diagram represents an individual method's or participant's findings. However, multiple Mental Models can easily be compared so that generalized or specialized models can be built.

Mental Models derived from a Card Sorting provide top-level concept information but do not necessarily provide much detail. Also they do not aim for complete coverage of all relevant (sub-)concepts.

#### 3.3.4.1 Relevance

The main purpose for Mental Models in this project is to evaluate Card Sorting results. Commonalities and differences between individual Card Sorting results are being captured and then organized to reflect typical Mental Model elements such as analogies, concepts, organizing criteria, grouping criteria and task flow. These elements are then used during interaction design as well as for findings and recommendations to the industry partner.

### 3.3.4.2 Implementation

Creation of the Mental Model was done as a team-whiteboard-session, where elements were identified and further developed and generalized. The result was then documented in a combination of descriptive text and tables. The tables were structured in analogy to the long-horizon diagram described by Young <sup>[Y108]</sup>.

The Mental Model is documented in chapter 4.1.4.2 [Mental Model and Future Structure](#).

### 3.3.5 Prototyping

|                              |   |   |   |   |   |
|------------------------------|---|---|---|---|---|
| Contribution to Deliverables | ■ | ■ | ■ | ■ | ■ |
| Relevance to Hypothesis H2   | ■ | ■ | ■ | ■ | ■ |
| Effort to Implement          | ■ | ■ | ■ | ■ | ■ |
| Perceived Complexity         | ■ | ■ | ■ | ■ | ■ |
| Number of People Involved    | ■ | ■ | ■ | ■ | ■ |

The word prototype derives from the Greek and can be translated as ‘primitive form’ or ‘first impression’, which is really what a prototype is. Creating a prototype helps illustrate abstract requirements and it can act as a common language between project members and users.

The form of a prototype can be a simple GUI sketch, an exact pixel drawing or an interactive user interface.

The form and type of a prototype depend on its purpose. If the general impression should be verified, a broad prototype is needed. If a single use case is intended to be modeled, or a whole process displayed, without showing any sideways, a narrow but deep prototype is chosen. The tool used to create a prototype depends on the form needed. Paper and pencil can be used for hand sketches, PowerPoint for simple wireframes, Photoshop for exact pixel

drawings and HTML for interactive user interfaces. Low-Fi and hi-fi are also common words to describe the form of a prototype. The simpler a prototype is, the more it heads towards low-fi, the closer a prototype is to the final solution, the more it heads towards hi-fi. As illustrated, the form of a prototype greatly influences feedback received – therefore the form has to be chosen carefully.



Figure 20 – Prototype Form vs. Feedback

#### 3.3.5.1 Relevance

The prototypes created in this project are used to illustrate and communicate recommendations. Early wireframe prototypes are verified using Hallway Testing. They are then refined so that later prototypes properly illustrate possible solutions for the recommendations. The type of prototype follows its purpose.

#### 3.3.5.2 Implementation

For small incremental recommendations we used graphical imaging software to illustrate the concept. This was done either directly within the screenshot of the existing interface or in a separate small drawing. It follows Cisco's CAMP style guide, which is used by Smart Call Home today.

For more significant structural changes we used wireframe prototypes. Simple wireframe prototypes were created using Balsamiq during the last phase of the project. Balsamiq is a tool to rapidly create prototype wireframes or even clickable mockups. The results are low-fi and appear almost like manual line drawings. A set of Balsamiq sample components are available to reflect the corresponding components of Cisco's Kubrick style guide. During Hallway Testing printed wireframe prototypes have been used. For recommendations related to the user experience and application appeal, graphical prototypes based on the Kubrick tools available are used. The prototypes are described in detail in chapter 4.3.2 [Prototypes](#).

### 3.3.6 Hallway Testing

|                              |   |   |   |   |   |
|------------------------------|---|---|---|---|---|
| Contribution to Deliverables | ■ | ■ | ■ | ■ | ■ |
| Relevance to Hypothesis H2   | ■ | ■ | ■ | ■ | ■ |
| Effort to Implement          | ■ | ■ | ■ | ■ | ■ |
| Perceived Complexity         | ■ | ■ | ■ | ■ | ■ |
| Number of People Involved    | ■ | ■ | ■ | ■ | ■ |

As Joel Spolsky from Openhallway.com says, 'a hallway usability test is where you grab the next person that passes by in the hallway and force them to try to use the code you just wrote.' Hallway Testing can be used for software code but also for lots of other areas. Rather than using an in-house, trained group of testers, three to six random people, indicative of a cross-section of end users, are brought in to test the product or service. According to Jakob Nielsen<sup>[JN93]</sup> who defined Hallway Testing, even a random group of three to six people should find most usability issues using this method. Hallway Testing can be used to identify any instructions or questions that are difficult to understand, use of language or terms that might not be understood, relevant answer options that are missing from a question or negative and positive aspects of design or layout. Hallway Testing only needs a handful of people and does not take a long time. It is a very effective and efficient method to test the product or a service. It can be executed as a method of requirement engineering or interaction design, depending on what is to be tested.

#### 3.3.6.1 Relevance

The aim of the Hallway Tests was to see whether the prototypes were self-explanatory and were favored in comparison to current actual screens. The Hallway Test was aimed at supporting our ideas and verifying and approving our recommendations before handing over the results.

#### 3.3.6.2 Implementation

Hallway Testing was utilized during the last phase of the project. Two equivalent wire frame prototypes were printed on paper. We then asked the participants simple questions, such as which option they preferred or where in each option they would expect to find a specific element. Their answers as well as additional comments and opinion provide valuable hints about the preferred design. Participants were a mix of attendees of a Cisco technical training and co-workers of Bruno's at Cisco. All participants had a basic understanding of Smart Call Home and were potential users based on their job roles.

## 3.4 Addressing Stress

Each method in requirements engineering and interaction design has its main purpose. The chosen methods either focus on project management questions, Stakeholder engagement, requirement engineering based on user, context, task, and system analysis or on interaction design. To ensure aspects of relevant stress are

adequately incorporated in each step throughout the project, we have complemented several methods based on our background research.

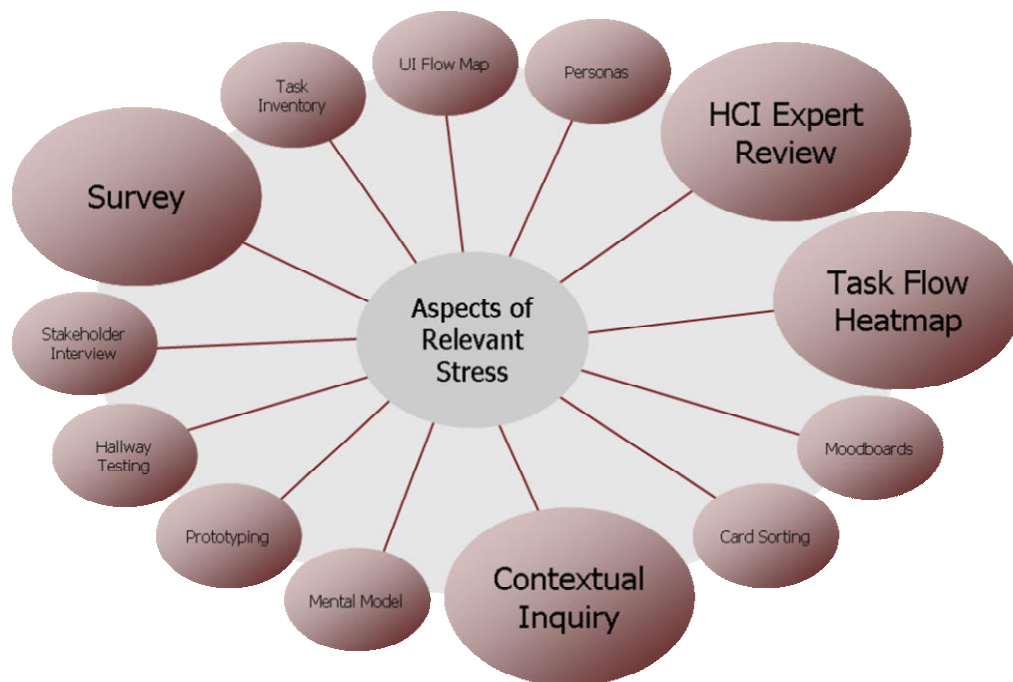


Figure 21 – Contribution of UCD Methods towards Aspects of Relevant Stress

Methods with a specific focus on aspects of relevant stress are the Survey, the HCI Expert Review, Task Flow Heatmap and Remote Contextual Inquiry. The Survey detects whether the users and potential users experience stress on their job along with distractions that may occur. The HCI Expert Review identifies weak points of Smart Call Home according to UCD aspects in order to reveal possible contributing stress factors. The Task Flow Heatmap shows indirections users take to fulfill a task. Eliminating these indirections ease the use of Smart Call Home, decrease the time needed to accomplish a task and therefore counter contributing stress factors. Observing the users perform the set tasks during Remote Contextual Inquiry revealed out usability issues and ambiguity.

The resulting stress relevant information from the methods of requirements engineering and interaction design is pulled together and described in 4 [Completed Work](#) and 5 [Results and Discussion](#).

### 3.4.1 Perceived Stress Scale

Several of the user centered design methods focusing on requirements engineering or interaction design can be augmented to deliver information about stressors, contributing factors or effects of stress. However none of these methods measure the level of stress experienced by the users.

Methods exist to measure physical and psychological stress but they are not trivial in use and often rather intrusive. Therefore it is questionable whether measuring stress itself is a viable approach in the context of user centered design. Furthermore the correlation between stress and effects on behavior is not trivial either and has only been modeled and understood in selective areas.

On the other hand there is a small number of methods which aim to gauge perceived stress rather than physical or psychological stress. A strong correlation between perceived stress and effects on behavior has been documented in numerous research papers. The most often used and referred to instruments in this area is the Perceived Stress Scale (PSS) by Cohen et al <sup>[CK83]</sup>. Correlation of the PSS with medical or

physiological notions of stress has not been proven. This would be relevant when investigating long-term effects of stress, however it is not relevant for the purpose of this project

The PSS consists of a small number of questions (there are 4, 10 and 14 item versions) which are easy to understand and have to be answered by selecting the most appropriate out of 5 provided standard answers.

8. In the last month, how often have you felt that you were on top of things?  
 \_\_\_0=never \_\_\_1=almost never \_\_\_2=sometimes \_\_\_3=fairly often \_\_\_4=very often

Figure 22 – Example of a PSS positive item

There are positive and negative items. Scores are obtained by reversing the scores on the positive items, and then summing across all items. This leads to a total score for one individual completion of the PSS. When evaluating PSS scores it is important to understand PSS does not provide absolute or normalized measures nor does it offer any set thresholds. PSS only provides a subjective perceived measure for an individual.

We therefore only use it to compare relative PSS scores of the same individuals across different situations. No comparison of the PSS score between individuals nor any conclusions based on the actual value of the PSS score has been made.

In addition to the standardized 4, 10 and 14 item versions for general purpose use, there are numerous reports providing guidance and experience to adapt the PSS to other languages and also specific situations. For the purpose of this project we used a 5 item variant of the PSS which individuals responded to twice for two different situations:

|               |                                                      |
|---------------|------------------------------------------------------|
| Situation I:  | Ongoing network administration and management work   |
| Situation II: | Critical network troubleshooting or maintenance work |

Figure 23 – Two Situations used to PSS answers

1. In the last month, how often have you felt that you were unable to control the important things in your job?  
 \_\_\_0=never \_\_\_1=almost never \_\_\_2=sometimes \_\_\_3=fairly often \_\_\_4=very often

2. In the last month, how often have you felt that you were on top of things?  
 \_\_\_0=never \_\_\_1=almost never \_\_\_2=sometimes \_\_\_3=fairly often \_\_\_4=very often

3. In the last month, how often have you felt nervous and "stressed"?  
 \_\_\_0=never \_\_\_1=almost never \_\_\_2=sometimes \_\_\_3=fairly often \_\_\_4=very often

4. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?  
 \_\_\_0=never \_\_\_1=almost never \_\_\_2=sometimes \_\_\_3=fairly often \_\_\_4=very often

5. In the last month, how often have you felt that things were going your way?  
 \_\_\_0=never \_\_\_1=almost never \_\_\_2=sometimes \_\_\_3=fairly often \_\_\_4=very often

Figure 24 – PSS Variant with 5 Items – as used in the Survey

## 4 Completed Work

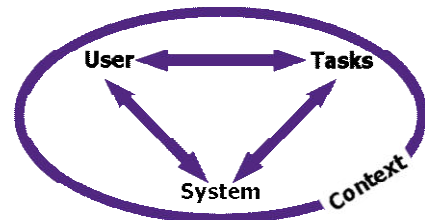
### In This Chapter

The work items and artifacts established using our set methodology are described in this chapter. Besides crucial information to users, tasks, context and the system you will read about the actual stress relevant aspects. In 4.3 **Deliverables** the detailed categorization and description of the Personas as well as the prototypes created to illustrate the recommendations are described.

This chapter is limited to presenting facts. Our evaluation and judgment of the outcome are left to the subsequent chapter 5 **Results and Discussion**.

### 4.1 Project Internal

We have used a range of methods for requirements engineering and interaction design – some of their results are for project internal use only rather than directly contributing to the discussion and deliverables. Work completed for our internal use is organized according to the principal components of human-machine interaction defined by Shackel and Richardson<sup>[SR91]</sup>.



#### 4.1.1 About Users

To establish our initial overview of, and feeling for the potential user population for Smart Call Home we used a series of unobtrusive observation activities – comparable to Safari or bird-watching. We sat in the back of training classes, joined and overheard break-room discussions, looked over the shoulders of co-workers, browsed through the registration lists of targeted events, read the relevant student and graduate profiles<sup>[CC08]</sup> and studied the user profiles of existing Smart Call Home users.

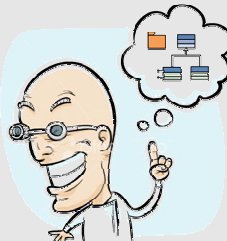
|            | Surfing Oscar                                                                       | Superior Edison                                                                     | Eager Peter                                                                          | Rational Sue                                                                          |
|------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|            |  |  |  |  |
| Job Role   | Network Operator                                                                    | Network Engineer                                                                    | Partner Engineer                                                                     | Support Engineer                                                                      |
| Works at   | Customer                                                                            | Customer                                                                            | Partner or Cisco                                                                     | Cisco                                                                                 |
| Work Hours | Shift                                                                               | Fixed                                                                               | Flexible                                                                             | Shift                                                                                 |
| Motivation | Keep it simple                                                                      | Make it work                                                                        | Sell the concept                                                                     | Find the root-cause                                                                   |

Table 4 – Comparison of Provisional Personas

This provided us with an idea of who we might need to include in our analysis of the user. It also helped define how to best engage with them and what type of questions to ask. We conducted the Stakeholder Interviews and a first round of Survey with three potential Provisional Personas in mind – later called Surfing Oscar, Eager Peter and Rational Sue. It soon became clear that we needed to introduce Superior Edison as an additional Provisional Persona with similarities to both, Surfing Oscar and Eager Peter but with distinct motivation, responsibilities and work style.

During this early phase we used Moodboards intensively to describe and discuss our perception and also as a tool to identify gaps and aspects we didn't understand yet (see Appendix IV.e – Moodboards).

Throughout the project, we refined the Provisional Personas. When we moved from requirements engineering towards interaction design the structure for the final Personas was created and populated with information. At this point it became obvious that Oscar is the primary Persona for Smart Call Home, Peter and Sue are both secondary Personas and Edison is a supplementary Persona. The Personas are described in 4.3.1 Personas.

### 4.1.2 About Tasks

At first the tasks for which Smart Call Home is being used seem well known and understood. A closer task analysis however reveals additional tasks as well as additional details. After taking into account input from Stakeholders as well as from multiple requirements engineering methods, we can see that the existing tasks supported by Smart Call Home cover the majority of tasks identified. There are some interesting areas however, which may indicate room to extend Smart Call Home and make it even more relevant.

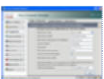
| Registered Device                                                                                                                                                                                  | Mail Server                                                                                           | Transport Gateway                                                                                                                                                                              | Network Operator                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Network Engineer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | SmartCallHome on cisco.com                                                                                                                                                                                                                                               | CRM System                                                                                                            | Support Engineer                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                 |                    |                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                      |                                  |                                                                                                                                                                                                                                                                                                                                                          |
| <ul style="list-style-type: none"> <li>send message</li> <li>configuration</li> <li>diagnostic</li> <li>environmental</li> <li>inventory</li> <li>request</li> <li>syslog</li> <li>test</li> </ul> | <ul style="list-style-type: none"> <li>none (contributing to tasks but not initiating any)</li> </ul> | <ul style="list-style-type: none"> <li>send device notification</li> <li>send server status notification</li> <li>check for software update</li> <li>notify pending software update</li> </ul> | <b>Setup</b> <ul style="list-style-type: none"> <li>Deploy TG</li> <li>Register Device</li> <li>Remove Device</li> </ul> <b>Historical</b> <ul style="list-style-type: none"> <li>Device Reports</li> <li>History Reports</li> <li>SR Status Reports</li> <li>Inventory Report</li> <li>Registration Reports</li> </ul> <b>Incident</b> <ul style="list-style-type: none"> <li>Create / update SR</li> <li>Implement recommended steps (from SCH, Support Eng or Proactive Eng)</li> <li>Ask / Search for similar incidents</li> <li>Gather related information</li> </ul> <b>Ongoing</b> <ul style="list-style-type: none"> <li>Get Overview / Dashboard</li> <li>Actionable messages</li> </ul> | <b>Setup</b> <ul style="list-style-type: none"> <li>Deploy TG</li> <li>Register Device</li> <li>Remove Device</li> </ul> <b>Historical</b> <ul style="list-style-type: none"> <li>Device Reports</li> <li>History Reports</li> <li>SR Status Reports</li> <li>Inventory Report</li> <li>Registration Reports</li> </ul> <b>Incident</b> <ul style="list-style-type: none"> <li>Proactive / Comparative Reports</li> </ul> <b>Incident</b> <ul style="list-style-type: none"> <li>Create / update SR</li> <li>Implement recommended steps (from SCH, Support Eng)</li> <li>Recommend steps</li> </ul> | <b>Incident</b> <ul style="list-style-type: none"> <li>Notify Device SR Contact = Admin (Operator or Engineer)</li> <li>Create SR in CRM (S3/Synergy)</li> <li>Update SR</li> <li>Notify Operator and/or Engineer (EOL, EOS, PSIRT, relevant Known Bug, ...)?</li> </ul> | <b>Incident</b> <ul style="list-style-type: none"> <li>route SR</li> <li>update SR</li> <li>update SCH App</li> </ul> | <b>Setup</b> <ul style="list-style-type: none"> <li>...</li> </ul> <b>Historical</b> <ul style="list-style-type: none"> <li>...</li> </ul> <b>Incident</b> <ul style="list-style-type: none"> <li>Device Reports</li> <li>Comparative Reports</li> <li>update SR</li> <li>Register Device</li> <li>Recommend steps</li> </ul> <b>Problems</b> <ul style="list-style-type: none"> <li>Initiate SCH Rule Update</li> <li>Trigger PMA</li> </ul> |

Figure 25 – Task Inventory by Task Initiator

The most clearly identified areas where Smart Call Home could support users more effectively are:

- Overview: while pin-point information and reactive historical reporting are covered well today, Smart Call Home does not make it easy to obtain an overview quickly. This is an observation

supported by many methods and also addressed in more detail in 4.3.2.1 [Overview Page – Dashboard](#) and 5.2 [Findings and Recommendations](#).

- **Comparative Information:** Oscar may be asking himself ‘what is the difference between the device with many messages and the other one with none?’. Before meeting his next customer, Peter would like to know ‘how is this customer performing compared to my other customers?’ so that he can make appropriate recommendations or share lessons learned by other customers. When Oscar, Sue and Edison are solving an incident, it would be useful to know what actions have been taken by other customers with the same problem. When Peter is involved in either solving an incident or in a debrief after a major incident, he would like to compare this customer’s design against similar designs. And many users, when confronted with seemingly unsolvable challenges, may ask themselves ‘am I the only one on this planet with this problem?’. Smart Call Home already today holds a large part of this information and could be extended to share it with its users. It could also potentially be used to capture and share meaningful related information, such as: which of the recommended actions have actually been implemented?
- **Actionable Information:** Smart Call Home can provide a large number of messages, recommendation, alerts and data for a device. When a customer owns a larger network it is essential to quickly find high severity actionable information. For smaller networks this is well achieved by alerting Oscar via email. For larger networks and organizations there may be multiple Oscars and neither Edison nor Peter is expected to react upon all notifications. It therefore becomes important to also provide an intuitive overview and guidance towards the most relevant and urgent information via the Smart Call Home web interface.
- **Integration with Support Request Handling:** Interactions with Sue are always tracked via Cisco’s support request management, which includes a trouble ticketing tool (TTT). Likewise customers and partners track their interactions with end-users, customers and vendors via TTT systems. Furthermore both Sue and Oscar work shifts and frequently hand over partially solved incidents to their peers. It may therefore be desirable to extend Smart Call Home’s current light integration with the Cisco support request management, to, for example, reflect and capture status information. Likewise it may be desirable to provide similar information and possibly integration capabilities with the TTT systems at partners and customers.

In contrast to our own expectation and in contrast to assumptions made by one of the product management Stakeholders, the task analysis did not reveal much interaction with EMS, NMS or fault- and event management systems at customer site.

### 4.1.3 About Context

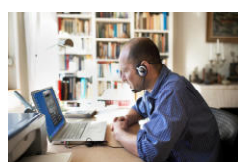
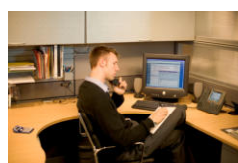
Users use Smart Call Home from within typical environments. Much the same way Personas illustrate typical users, we use the following context descriptions to describe and compare the typical contexts from which Smart Call Home is being used. There are four distinct contexts, some of which are being used by multiple Persona. Also some Persona work from within more than one context, depending on the task at hand or the method of engagement.

Context information has been gathered from Stakeholder Interviews, Surveys, Remote Contextual Inquiries as well as through observation and discussion during many of the user related methods. Context is physical but also includes electronic, emotional, motivational and social aspects. Many of the stress related factors are also defined or influenced by context – this is discussed in more detail in 4.2 [Dealing with Stress](#). To some extent, context also dictates or limits the use of tools.

|                | Office Workplace                                                           | Network Site                                                                                             | On-The-Road                                      | Support                                                                              |
|----------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------|--------------------------------------------------------------------------------------|
| Phone          | Desk phone and Mobile phone                                                | Mobile phone                                                                                             | Mobile phone                                     | Desk or Soft phone with Headset                                                      |
| Web Access     | PC or Notebook, wide or dual screen                                        | Notebook<br>Mobile phone                                                                                 | Notebook<br>Mobile phone                         | PC or Notebook, wide or dual screen                                                  |
| Other Tools    | NMS Software, Trouble Ticketing System, Documentation                      | NMS Software, Element Manager, Telnet Client, Console Cable                                              | Trouble Ticketing System, Documentation<br>WebEx | CRM System, WebEx, Netmeeting                                                        |
| Light          | good                                                                       | Poor light and reflections                                                                               | Varies                                           | good                                                                                 |
| Noise          | Normal office level background, can provide social involvement and control | Possibly high levels of operating and HVAC noise, can be unnerving and distracting                       | Varies, can be distracting                       | Blocked out by headset                                                               |
| Ergonomics     | Close to ideal, some elements are often Personalized.                      | Bad or very bad. Limited space, sometimes no seat or desk, screens or keyboards can be in odd positions. | Varies – typically seating is far from optimal.  | Optimized for purpose. Limited Personalization. Sometimes time-shared across shifts. |
| Used by Oscar  | Most of the time                                                           | Sometimes                                                                                                | Rarely                                           | Never                                                                                |
| Used by Edison | Often                                                                      | Sometimes                                                                                                | Often                                            | Never                                                                                |
| Used by Peter  | Sometimes                                                                  | Sometimes                                                                                                | Often                                            | Never                                                                                |
| Used by Sue    | Never                                                                      | Never                                                                                                    | Never                                            | All the time                                                                         |

Table 5 – Comparison of Contexts

#### 4.1.3.1 Office Workplace Context



The office workplace context is characterized by favorable ergonomics, enough space, dual or multiple monitors and common office tools and facilities being readily available. There is room for storage so that books and manuals can be kept nearby. Whiteboard, pins and post-it notes or calendars are often used for semi-transient information. Size of the complete office may vary but the actual desk is Personal and not shared with anyone else.

A small number of monitoring applications are visible permanently, some may even be projected on a shared screen. Depending on the task at hand, multiple other applications such as telnet/ssh client, software such as Switch Fabric Manager or

Cisco Works, trouble ticketing systems and documentation could be used. Interacting with peers and colleagues is simple and frequent.

Limitations of this context are the fact that physical interaction with the device is not available and sometimes privacy in an open floor office may be reduced.

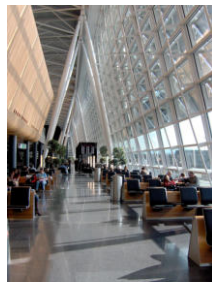
#### 4.1.3.2 Network Site Context



The network site context is optimized as the operating location for the network and IT infrastructure. Most of the time it provides automated heating, ventilation and air-conditioning (HVAC) to match the requirements of the equipment. Both safety and security are high – badged doors, surveillance cameras and automated fire suppression systems are commonly used. Combustible material is restricted or completely banned. While this is a good environment for IT infrastructure, to human beings it means noise, heat, random air currents, no privacy and limited access to tools and documentation.

Whatever is accidentally dropped is likely to disappear between the cracks of the raised floor. Having a conversation can be difficult, books and manuals are elsewhere. Light conditions can be challenging. Work has to be done either from installed rack consoles or from a notebook. Working positions can involve anything from a small desk, a retractable rack tablet, standing in a narrow aisle or even sitting on the floor. Limitations dominate in this context. However it is the only place, which allows physical interaction with the network device. Inserting, removing or re-seating modules, physically (dis-)connecting cables or observing LED indicators require access to this context. Often power cycling of devices or connecting via a console is also done from this context.

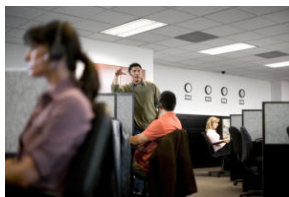
#### 4.1.3.3 On-The-Road Context



This context varies heavily. The typical mental picture is Peter sitting in a lobby or lounge with his notebook on the lap and the cell phone earplug in one ear. However, this context can also be a hotel room, a proper office at a partner or customer company, a restaurant, a car, a railway station or airport or even the reception area of a company campus.

While a notebook and mobile phone are readily available, further office facilities are inexistent. Limited privacy is very common, face-to-face interaction though is not. Connecting to the internet or corporate applications is done via remote access over the internet, which means bandwidth is limited and reliability may not be optimal.

#### 4.1.3.4 Support Context



A support office has been optimized for this single purpose. The actual workplace is sometimes shared with peers who work other shifts. Books, manuals, and even physical equipment samples are available. They may be on the desk or if the desk is shared they may be on a trolley or movable shelf. Cubicles or islands of desks are arranged within a larger open floor office.

Within the office, all workplaces are used for the purpose of the support organization. Powerful communication tools, support request queue management and good quality headset/microphone are commonly used.

#### 4.1.4 About The System

During early background research and requirements engineering we focused on obtaining a solid overview of Smart Call Home's current structure. We then compared the current system against findings we collected from the other study areas. This provided the foundation to identify and establish suitable concepts for a future system structure. Much of the work in this chapter is subsequently applied to articulate findings and recommendations and to create prototypes.

##### 4.1.4.1 Current Structure and Usage

To document the interface structure as well as possible navigation flows through the interface, we use UI Maps and UI Flow Maps. The UI Flow Map can be seen as an overlay to the UI Map. Included in these maps are interfaces of the Smart Call Home web application – including the automated email notifications sent by it. Excluded from the maps are interfaces outside the web application, such as the device's command line interface, the Smart Call Home Transport Gateway's native GUI or the Cisco support request management applications. See Figure 26 – UI Flow Map of the current System and Appendix IV.g – Task Flow Heatmap Input.

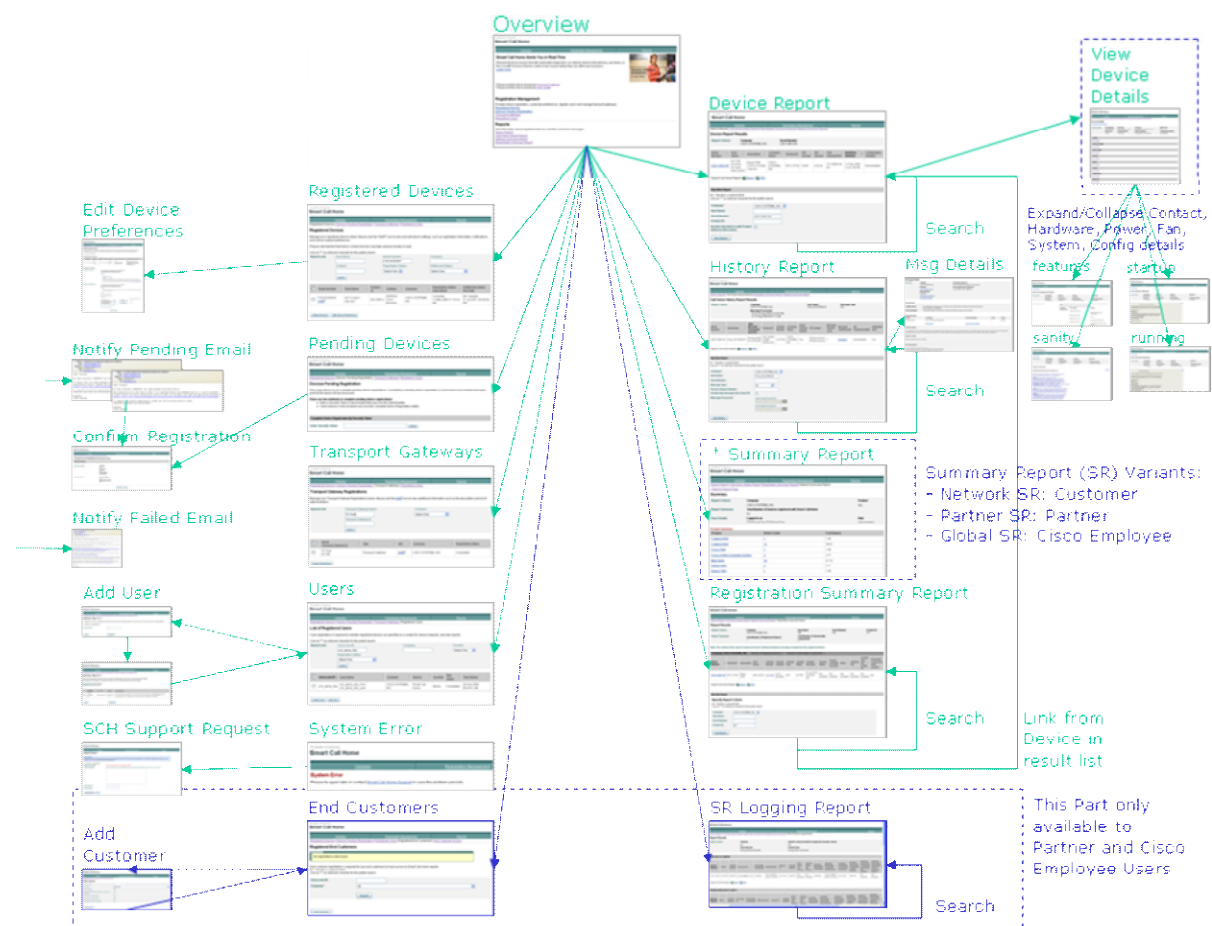


Figure 26 – UI Flow Map of the current System

This provided us with a complete inventory of UI screens and navigation flows. The inventory was useful for designing and implementing subsequent methods such as HCI Expert Review, Remote Contextual Inquiry or Card Sorting.

To complement our qualitative research with quantitative data, we collected and analyzed actual usage data of the current system. Based on a customized version of Unica NetInsight's Enterprise Web Analytics application<sup>[NI09]</sup> a range of access data and usage trail information is available. We've chosen to collect and analyze the full month of September 2009 since it fitted with our project schedule and since it is less affected by holidays or major events, compared to for example August. Page hit frequency and most often used navigation paths are then overlaid on top of the UI map as illustrated in Figure 27 – Task Flow Heatmap. On the Heatmap, color codes indicate the most often accessed pages (such as Overview or Device Report) versus the least often accessed screens (such as System Error). The most used navigation trails are indicated by bold arrows.

The statistical information obtained from Web Analytics to produce the Task Flow Heatmap as well as the UI map and UI Flow Map in larger scale are available in Appendix IV.g – Task Flow Heatmap Input.

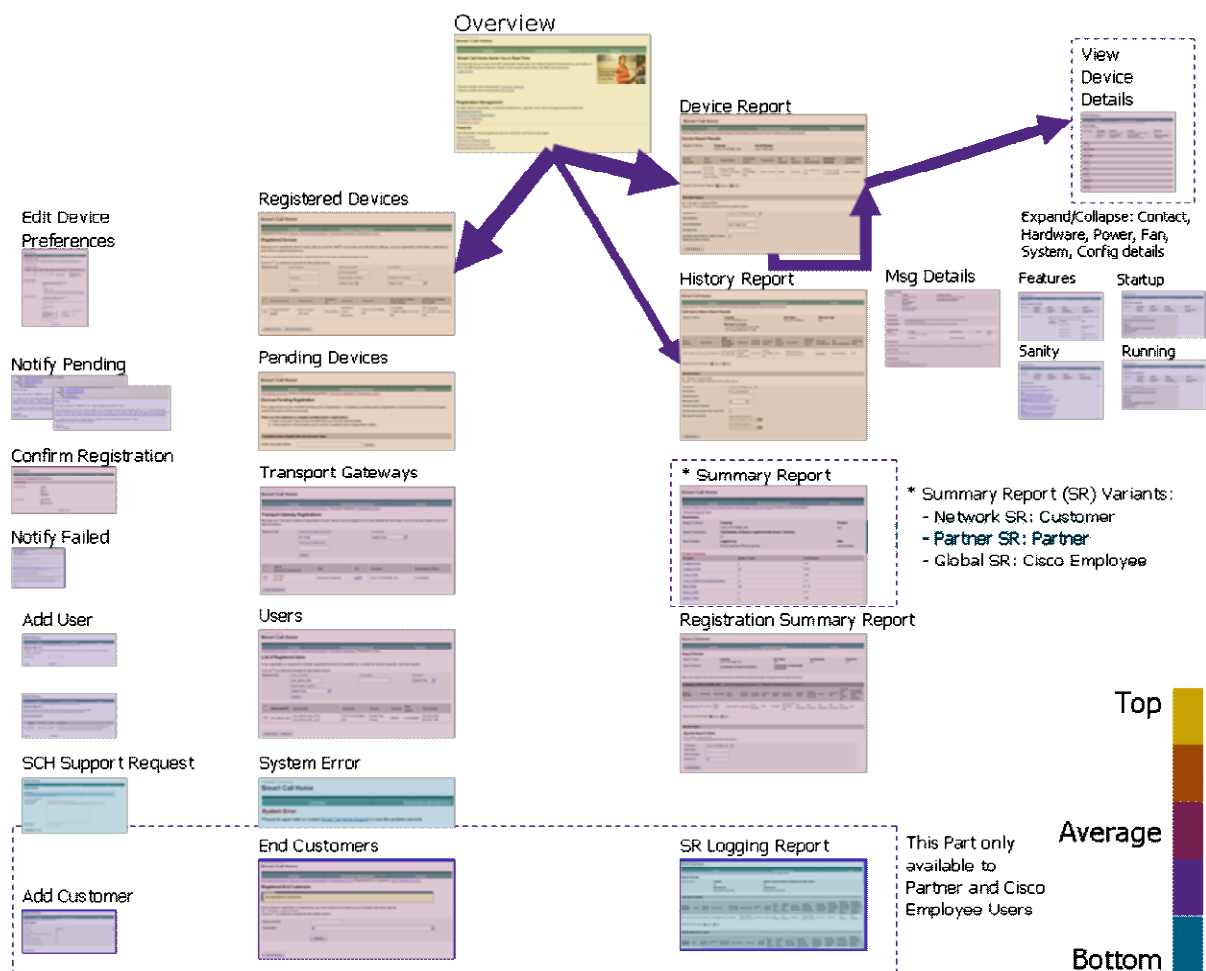


Figure 27 – Task Flow Heatmap

The work items completed during this phase reveal some interesting facts. The most dominant observation is that the Overview page is the most often accessed page, but holds very little information besides redundant navigation links. The vast majority of paths starting at the Overview page navigate either to the Device Report or the Registered Devices pages. These two combined are more often accessed than the Overview page alone, which could indicate some ambiguity between them. Another interesting observation is related to the path from Device Report to Device Report. This could be an indicator that repeated searches are commonly needed before a specific device is found and the path to View Device Details is selected.

A reassuring observation is that System Error is one of the least often seen pages of Smart Call Home. Also in the list of the least often requested pages are a few references to plausibly sounding but inexistent pages. This could be due to a number of reasons such as temporary test pages, faulty navigation links or users manually typing locations into their browser. While we believe there are bigger problems to solve, it may be an area worth of keeping an eye on.

#### 4.1.4.2 Mental Model and Future Structure

Card Sorting and the Mental Model derived from it are used to derive a suitable top level structure for future versions of Smart Call Home.

Common concepts created by card sort participants describe the common structure and elements of the Mental Model. Comparing the current structure of Smart Call Home and the Mental Model challenges the current structure. The aim of the Mental Model is to provide a basis for navigational improvement.

To visualize the Mental Model, we captured the card sorts electronically, put the output on a whiteboard and identified similarities in a team session. From the similarities we deduced the common concepts and came to the following conclusions. Uncommon concepts are discussed and discarded unless they fit elsewhere.



Figure 28 – Mental Model Session based on Card Sorting Results

Four common concepts are derived from the Mental Model, constituting the top-level ordering principles: Meta, Tasks, Assets and Reports. The Cards and Mental Model analogies are then captured in a brief description and compared against the model used for the current Smart Call Home web application. The Mental Model is not aimed at describing a complete set of concepts, but rather only to identify the top-level ordering principles.

## Meta

|                    | Frequent Cards                                                                                                                     | Mental Model                                                                                                                                                                                   | Current Smart Call Home Model                                                                                                                                                                                                                                                                               |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MM01 Overall       | Logout   Search functions   Documentation   Quick Fixes   Dashboard   Blog                                                         | Functions with overall scope or without relation to a specific asset. They are seen as overall functions at a tool- or meta-level.                                                             | Apart from few functions and sections such as dashboard or documentation, the terms occurring in the overall group are not part of the current Smart Call Home concept. According to the similarities it seems to be a common concept to group overall functions, which do not have dependencies to assets. |
| MM02 Documentation | Blog   Release Notes   User Guide / Introduction   Documentation   Latest Functionality   Recommended Actions   Quick Fixes   FAQs | General information, which addresses users in general, not individual users. General information such as user guide or FAQs is arranged in a separate group, independent from assets or tasks. | Only user guides are treated as general information and located on the overview page, independent from assets or tasks.                                                                                                                                                                                     |

Table 6 – Mental Model – Meta Concept

## Tasks

|             | Frequent Cards                                                          | Mental Model                                                         | Current Smart Call Home Model                                                                                                      |
|-------------|-------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| MM11 Search | Overall Search   Search User   Search Device   Search Transport Gateway | The search functions build their own group, independent from assets. | There is no overall search function, only specific search functions embedded inside pending devices, registered devices and users. |

Table 7 – Mental Model – Tasks Concept

## Assets

|                                     | Frequent Cards                                                                                                                | Mental Model                                                   | Current Smart Call Home Model                                                                                                                                                                                           |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MM21 Devices and Transport Gateways | Edit Device Registration   Registered Devices   Config Sanity Analysis   Pending Devices   Device Report   Transport Gateways | Devices and activities related to devices are grouped together | Device related information is split into two main groups: registration management and reports. Registration management contains pending and registered devices, users and gateways. Reports contains reports of devices |

|                                |                                                                    |                                                                                                |                                                                                            |
|--------------------------------|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| MM22<br>Users and<br>Customers | Search User, Add User, Add<br>End Customer, End<br>Customer, Users | Terms regarding user. In most<br>cases the term Search User is<br>also assigned to this group. | Functionalities regarding user<br>details have an own section in<br>the current structure. |
|--------------------------------|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|

Table 8 – Mental Model – Assets Concept

## Reports

|                 | Frequent Cards                                                                                  | Mental Model                                                                                                                                                  | Current Smart Call Home<br>Model                                         |
|-----------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| MM31<br>Reports | Device Report, Advisory<br>Report, SR Logging Report,<br>Summary Report,<br>Registration Report | All terms containing the word<br>Report. According to the<br>Mental Models these terms are<br>not associated with device<br>functions but treated separately. | Reports have an own menu<br>item but can also be accessed<br>via device. |

Table 9 – Mental Model – Reports Concept

## 4.2 Dealing with Stress

There are four different Persona-groups of Smart Call Home-users. These Personas act in different job roles. The grade of responsibility and the motive for using Smart Call Home vary. One of the Personas main job content is to solve problems. Most of these problems are very critical and have to be solved in a very short time. People who deal with these kinds of problems every day are experienced and resistant to such pressure. Other Personas, which operate the network and act as first level more than as second level support, do not have the pressure of having to solve outages and other critical tasks on their own. They can pass over the responsibility to other departments and escalate the problems to higher levels and more experienced colleagues, partners or producers, as in our case Cisco.

Not all Personas respond to incidents in the same way. The stress initiators vary for every Persona. There will always be critical incidents; we cannot influence the configuration or the hardware of the network. But can help the users of Smart Call Home in critical situations by supporting them with user-friendly tools and by providing them with all the information they need.

### 4.2.1 Survey Evaluation

A total of 25 answers were submitted to the Survey, of which 2 had to be eliminated because neither situation I nor situation II was complete. The remaining 23 valid Survey answers were evaluated in three steps.

First we created summary and comparative charts to illustrate the variety and typical characteristics of answers. Even though some of the charts from this phase resemble statistical evaluations, their aim and content is different in that we are solely interested in qualitative and comparative information.

Secondly we produced graphical representations of individual answers – we called them ‘answer DNAs’ – to compare and group individual answers according to the frequency of situations, the delta in PSS value between situations and also according to similarities in answer patterns. Combined with our knowledge about Persona, relevant observations could be derived. An example of this step, with the answer sequences related to data recognition issues, is illustrated in Figure 29 – Survey Evaluation – Example of Answer DNA Comparison (Data Recognition).

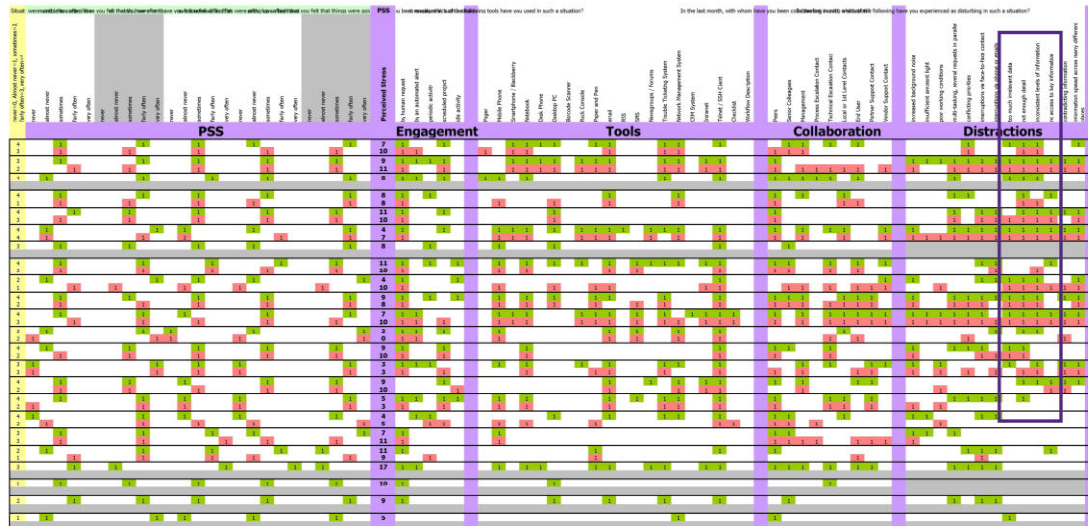


Figure 29 – Survey Evaluation – Example of Answer DNA Comparison (Data Recognition)

Intermediate tables and charts from the first and second step can be found in Appendix IV.h – Survey. Third and last we noted relevant observations obtained from the answer DNAs. The schema used to structure the observations is based on our background research on relevant stressors and contributing factors. In this third step we also included relevant free format comments provided by Survey respondents. An important subset of this third step is the evaluation of perceived stress scale answers. Due to the nature of PSS absolute measurements of stress or comparisons between individuals are invalid – PSS does not provide a normalized scale. However, comparison between an individual's PSS values for situation I versus situation II is valid. Therefore the comparison can only be made for the subset of valid Survey responses, which include fully completed PSS for situation I and situation II.

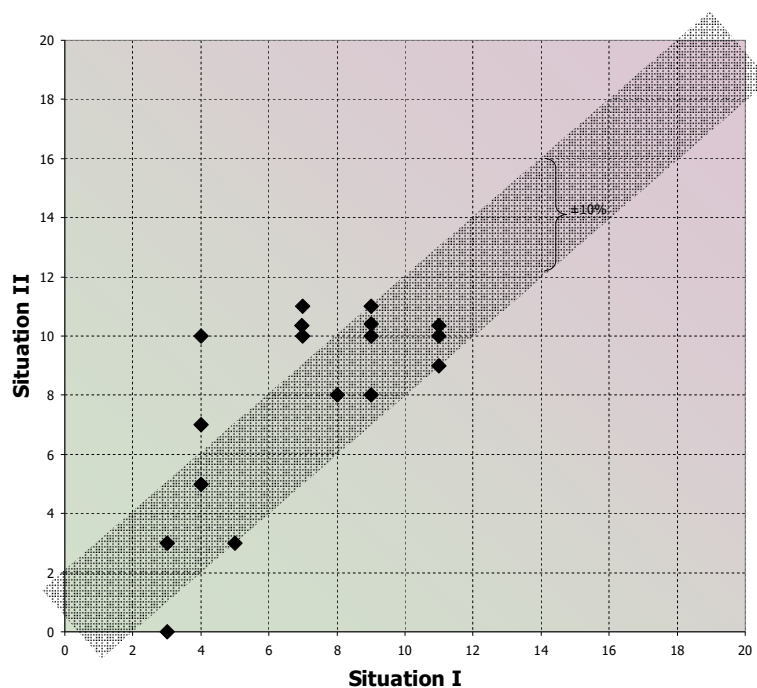


Figure 30 – Comparison of Perceived Stress in Situation I vs. Situation II

From the comparison of relative perceived stress based on the PSS we see that the majority of respondents share a perception of similar stress within  $\pm 10\%$ , a minority has higher perceived stress in situation II and only one answer shows lower perceived stress in situation II.

Only a subset of the theoretically known stressors and contributing factors are relevant for our project. After all the use of Smart Call Home is not life threatening nor does it directly impact one's physical integrity or health. By combining the background research on stress with our own findings, we are able to identify and categorize the most relevant categories of stressors and contributing factors related to the use of Smart Call Home.

#### 4.2.2 Social and Business

Stressors and contributing factors in this category are related to the user's position with the social and business network at the workplace.

| ID  | Stressor / Contributing Factor  | Effects on User                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S01 | Fear to fail                    | Leads to high pulse, tunnel vision, blackouts, uncontrolled or uneasy thoughts, mental leaps and inefficiency.                                                                                                                                                                                                                                                                                                                                                 |
| S02 | Isolation of an individual      | Devices and Gateways are usually at places where access to phone, pc or direct contact to other individuals is limited. In these situations the user is isolated and feels deserted. See also 4.1.3.2 <a href="#">Network Site Context</a> . Furthermore, resolution of incidents is often the responsibility of a small team or single individual. At a given point in time and location there is typically only a single individual assigned to an incident. |
| S03 | Loose credit amongst colleagues | Leads to high pulse, tunnel vision, blackouts, uncontrolled or uneasy thoughts, mental leaps and inefficiency.                                                                                                                                                                                                                                                                                                                                                 |

Table 10 – Stress Relevance – Social and Business

#### 4.2.3 Body and Mind

Physical and mental stressors and contributing factors, which can affect the user and user behavior may originate from the use of Smart Call Home or may also be existing already.

| ID  | Stressor / Contributing Factor         | Effects on User                                                                                                                             |
|-----|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| S11 | Information recognition                | In stressful situations the user does not have time to interpret, analyze or search information. Quick access to key information is needed. |
| S12 | High pulse                             | Leads to tunnel vision, bad eyesight, blackouts and uncontrolled or uneasy thoughts, mental leaps and inefficiency.                         |
| S13 | Multitasking                           | Hard to stay focused, quality of accomplished work might decrease, not totally considerate                                                  |
| S14 | Interruptions via face-to-face contact | Lose the plot, restart last task, need to remember last task                                                                                |

Table 11 – Stress Relevance – Body and Mind

### 4.2.4 Environment and Context

The environment and context can also be a source of stressors and contributing factors.

| ID  | Stressor / Contributing Factor                             | Effects on User                                                                                                                                |
|-----|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| S21 | Limited facilities such as phone, pc or other team members | The user is isolated, without direct access to help.                                                                                           |
| S22 | Insufficient ambient light – especially on network sites   | Visibility is limited, hard to spot the correct device or to read manuals                                                                      |
| S23 | Increased background noise                                 | Communication on the phone can be disturbed. This scenario is possible on network sites and in laboratories, where fans and machines are loud. |
| S24 | Interruptions via phone or emails                          | Lack of concentration, difficulties setting priorities, tiresome, hard to keep focused                                                         |

Table 12 – Stress Relevance – Environment and Context

## 4.3 Deliverables

### 4.3.1 Personas

The four Personas Oscar, Edison, Peter and Sue describe typical users of Smart Call Home. There is a comparative overview followed by more detail about each Persona.

|                | Oscar                                                                               | Edison                                                                              | Peter                                                                                | Sue                                                                                   |
|----------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                |  |  |  |  |
| Job Role       | Network Operator                                                                    | Network Engineer                                                                    | Partner Engineer                                                                     | Support Engineer                                                                      |
| Employer       | Customer                                                                            | Customer                                                                            | Partner or Cisco                                                                     | Cisco                                                                                 |
| Working Hours  | Shift                                                                               | Fixed                                                                               | Flexible                                                                             | Shift                                                                                 |
| Workplace      | Shared Desk / Field                                                                 | Desk / Office                                                                       | Mobile                                                                               | Desk / Cube                                                                           |
| Main Goal      | Keep it simple                                                                      | Make it work                                                                        | Sell the concept                                                                     | Find the root-cause                                                                   |
| Job Experience | ■ ■ ■ ■ ■ ■ ■                                                                       | ■ ■ ■ ■ ■ ■ ■                                                                       | ■ ■ ■ ■ ■ ■ ■                                                                        | ■ ■ ■ ■ ■ ■ ■                                                                         |
| Incidents      | ■ ■ ■ ■ ■ ■ ■                                                                       | ■ ■ ■ ■ ■ ■ ■                                                                       | ■ ■ ■ ■ ■ ■ ■                                                                        | ■ ■ ■ ■ ■ ■ ■                                                                         |
| Operations     | ■ ■ ■ ■ ■ ■ ■                                                                       | ■ ■ ■ ■ ■ ■ ■                                                                       | ■ ■ ■ ■ ■ ■ ■                                                                        | ■ ■ ■ ■ ■ ■ ■                                                                         |
| Projects       | ■ ■ ■ ■ ■ ■ ■                                                                       | ■ ■ ■ ■ ■ ■ ■                                                                       | ■ ■ ■ ■ ■ ■ ■                                                                        | ■ ■ ■ ■ ■ ■ ■                                                                         |
| Quote          | <i>Never touch a running system</i>                                                 | <i>Now let's do this once but right</i>                                             | <i>Do good and talk about it</i>                                                     | <i>Nothing is insolvable</i>                                                          |
| Persona Type   | Primary                                                                             | Supplemental                                                                        | Secondary                                                                            | Secondary                                                                             |

Table 13 – Comparison of Personas

The objective of this artifact is to communicate and illustrate our findings about Smart Call Home users. It shall facilitate a consistent perception of the users among product management and development of Smart Call Home. This enables a user focused development where a user's needs meet user-focused solutions. Oscar is the primary Persona, which means he is the most common user working with Smart Call Home. The development team should focus on the needs of Oscar, keeping in mind though that Smart Call Home has other users as well. Edison, Peter and Sue are secondary Personas who have additional needs on top of Oscar's. Those needs have to be evaluated and addressed in order for them to successfully use Smart Call Home. Developers can address the differing Persona needs through user authorizations, adjusted presentation or different functionalities.

It is useful to discuss the Personas with all members involved in the development of Smart Call Home, displaying the Personas somewhere they are always visible and present to the team members. User-centered development will increase the user satisfaction and ease their work.

The following table presents a brief overview of the Personas with a short comparison of the main job descriptions.

#### 4.3.1.1 Oscar

| Oscar                                                                              |                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Job Role                                                                                                                                                                                                                            |
|                                                                                    | Network Operator                                                                                                                                                                                                                    |
|                                                                                    | Employer                                                                                                                                                                                                                            |
|                                                                                    | Customer                                                                                                                                                                                                                            |
|                                                                                    | Working Hours                                                                                                                                                                                                                       |
|                                                                                    | Shift                                                                                                                                                                                                                               |
|                                                                                    | Workplace                                                                                                                                                                                                                           |
|                                                                                    | Shared Desk / Field                                                                                                                                                                                                                 |
|                                                                                    | Job Experience                                                                                                                                                                                                                      |
|                                                                                    | Focus on Incidents                                                                                                                                                                                                                  |
|                                                                                    | Focus on Operations                                                                                                                                                                                                                 |
|                                                                                    | Focus on Projects                                                                                                                                                                                                                   |
|                                                                                    |                                                                                                                                                                                                                                     |
|                                                                                    |                                                                                                                                                                                                                                     |
|                                                                                    |                                                                                                                                                                                                                                     |
| Who is Oscar?                                                                      |                                                                                                                                                                                                                                     |
| Education and Training                                                             | Technical School, Bachelor, On-the-Job Training                                                                                                                                                                                     |
| Industry Certifications                                                            | One or two of: MCSE, Linux+, CCNA                                                                                                                                                                                                   |
| Job Experience                                                                     | Took up the job straight after his study, since 2 years on the job                                                                                                                                                                  |
| Main Goal                                                                          | Keep it simple                                                                                                                                                                                                                      |
| Hobbies                                                                            | Diving, music, soccer                                                                                                                                                                                                               |
| Typical Quotes                                                                     | "Take it easy", "Green lights rule", "Never touch a running system"                                                                                                                                                                 |
| What is Oscar's Job?                                                               |                                                                                                                                                                                                                                     |
| Employer                                                                           | Customer – small, medium or large, any segment or vertical                                                                                                                                                                          |
| Typical Job Titles                                                                 | Network Operations Engineer @ large Regional Hospital<br>IT Services Operator @ small Industrial Company                                                                                                                            |
| Responsibilities                                                                   | Monitor the network, solve smaller network problems, maintain servers and devices, acquisition of hardware such as printer centers and network components, patching, release implementation, escalation of serious network problems |

|                                     |                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Work Style                          | Shares a desk with his colleague, uses the business mobile and notebook in order to accomplish stand-by-for emergency duties, some pictures of friends, parties and holidays hang on his own pin board, he uses email, telnet, chat, monitoring tools, check lists, and Smart Call Home. Oscar is very punctual, responsible and reliable |
| Incidents and Stress                |                                                                                                                                                                                                                                                                                                                                           |
| Dealing with Incidents              | Incidents are rare and not welcome. If he cannot solve incidents himself, he escalates to an internal higher support level or the companies IT partner. Incidents are tracked and passed on to his colleague after his shift ends.                                                                                                        |
| Stressful Experiences               | Release implementation and severe outages are stressful experiences. Directions at short notice are very unwelcome and annoying. Anything happening outside Oscar's control is scary.                                                                                                                                                     |
| Oscar's use of Smart Call Home      |                                                                                                                                                                                                                                                                                                                                           |
| Main Purpose                        | Avoid unpleasant surprises, register new devices, check problem solutions.                                                                                                                                                                                                                                                                |
| Dealing with Incidents              | Oscar is notified by email if a problem arises. By using the link in the mail he accesses Smart Call Home and checks the problem description. If he can not solve the problem himself, he sends a message to the IT partner or a superior colleague or team.                                                                              |
| Ongoing Network Operations          | He checks the device and transport gateway configurations and views end of life notices and other device specific information. Registration of new devices and transport gateways are checked and accepted in Smart Call Home.                                                                                                            |
| Tools and Artifacts used in Concert | Mail, telnet, ssh, EMS and NMS software, chat, checklists, manuals                                                                                                                                                                                                                                                                        |
| Primary Persona                     | <b>Oscar is the primary Persona for Smart Call Home</b>                                                                                                                                                                                                                                                                                   |

Oscar is working as network operator since 4 years. He studied IT at the technical school, which takes three years extra-occupational. His manager does not need to push him to do further educations, if there is an interesting course, which fits to his job demands and is within the time and cost budget of his department, he will apply to go. He tries to keep work and life in balance. He likes working shifts because it gives him the possibility to plan his free time in advance. Oscar is a communicative guy. He is not married yet but is in a long-term relationship with his girlfriend. He and his team colleagues are close and often have a drink after work or organize a grill party on the weekend. The partners of his colleagues join the guys on private occasions. To have a good time at work and be part of a caring team is what is most important to Oscar.

Even though he is a party guy, he acts very responsibly, which is one reason he has a good reputation. His manager knows he can rely on him. Oscar is a punctual guy and hands over the shift conscientiously. He obeys the most important rules in the department, which are punctuality, faithfulness, and personal responsibility. Apart from the network management tools, conventional messaging tools and the Internet, the command line is essential for a quick problem solving. If outages or network problems arise, he does his best to solve the problems straight away. If he cannot solve the problem himself, he does not hesitate to seek help from the network engineers. He believes it is not about collecting medals and appreciation; it is

his whole team, which has a reputation to loose. But Oscar still tries to escalate as few problems as possible; he does not want to lose his good reputation amongst the network engineers. Oscar keeps good company with the network engineers even though he feels the engineers are not always easy to handle

#### 4.3.1.2 Edison

| Edison                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
|  | Job Role                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Network Engineer |
|                                                                                   | Employer                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Customer         |
|                                                                                   | Working Hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Fixed            |
|                                                                                   | Workplace                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Desk / Office    |
|                                                                                   | Job Experience                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ■ ■ ■ ■ ■ ■      |
|                                                                                   | Focus on Incidents                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ■ ■ ■ ■ ■ ■      |
| Focus on Operations                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ■ ■ ■ ■ ■ ■      |
| Focus on Projects                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ■ ■ ■ ■ ■ ■      |
| Who is Edison?                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |
| Education and Training                                                            | Master of Information Technology                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |
| Industry Certifications                                                           | CCDP or CCIP, RHCE or MCSE, ITIL FC                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |
| Job Experience                                                                    | Worked as PC supporter before starting his IT studies, now since four years network engineer                                                                                                                                                                                                                                                                                                                                                                                  |                  |
| Main Goal                                                                         | Make it work, bring out the best of                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |
| Hobbies                                                                           | Motorcycling, Jazz, Poker                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                  |
| Typical Quotes                                                                    | “Now let’s do this once but right“                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |
| What is Edison’s Job?                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |
| Employer                                                                          | Customer – small, medium or large, any segment or vertical                                                                                                                                                                                                                                                                                                                                                                                                                    |                  |
| Typical Job Titles                                                                | Manager IT Services @ medium-sized Industrial Company, Technical Lead Core Networking @ challenger Service Provider, Network Design Engineer @ large public sector organization                                                                                                                                                                                                                                                                                               |                  |
| Responsibilities                                                                  | Act as superior support level, solves critical network outages if not solved by inferior support level, provide technical information to lower support level, purchase all network components and hallway print centers<br>Works more than 40% of his time on projects regarding network concept, printer concept, release changes, software maintenance and implementation.                                                                                                  |                  |
| Work Style                                                                        | Has his own desk, normally two in total, he needs a lot of space for books and disposers, works with a laptop and has shared pcs if working in a team to check the network and the network topology. In his office he keeps a few spare cables, routers and switches. He seldom works with checklists; he is more the routined guy who knows every step by hard. The manuals are artifacts he uses a lot, also industry manuals such as configuration tips provided by Cisco. |                  |

| Incidents and Stress                |                                                                                                                                                                                                                                                                                |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dealing with Incidents              | The inferior support level mostly deals with incidents. Only if major outages or unsolvable network problems arise, Edison needs to provide support. He also provides support after release changes or new HW integration, just to be there in case.                           |
| Stressful Experiences               | If release changes can not be accomplished due to side problems, if theoretical concepts do not work out in live and the fall back scenario takes place or if the inferior support level does not follow the plan for implementations that has been discussed earlier on.      |
| Edison's use of Smart Call Home     |                                                                                                                                                                                                                                                                                |
| Main Purpose                        | Check end of life reports, security alerts, configuration tips and failed device tests.                                                                                                                                                                                        |
| Dealing with Incidents              | Edison checks alerts in Smart Call Home by using the link in the alert mail sent by Smart Call Home. He checks the recommendations and solves the problem. If he can not solve the problem, he informs his partner or creates a trouble ticket to inform the industry partner. |
| Ongoing Network Operations          | Edison is superior and therefore acts as backup for the network operators. If Edison works in a small company, he will act as network operator as well as Network Engineer. Operating networks is more a means to an end than a passion.                                       |
| Project Management and Contribution | Checking end of life reports gives him enough time to buy new hardware, plan new releases or plan greater hardware replacements. He uses Smart Call Home to check the security alters and plans greater software adjustments accordingly.                                      |
| Tools and Artifacts used in Concert | Telnet, Internet, NMS software, other tools showing the network topology, mail to check test failures or end of life notices, Trouble Ticketing Tool, network design drawings, project planning tools, whiteboard, spreadsheets and databases.                                 |
| Secondary Persona                   | <b>Edison's additional needs are based on situations where he acts as team leader and/or last escalation step inside his company.</b>                                                                                                                                          |

Edison is working as network engineer since eight years but has joined the company only four years ago. After his study in IT engineering he had been working as network operator for one year and then changed to network engineering, which is the job he had headed for during his studies. Edison is married and has two kids. He met his wife during his study work. He tries to handle family and job equally but in most occasions he sacrifices more of his family life than his job, which is also why his wife jokes about Edison being married rather to his job than to her. He is a communicative guy who gets very excited when talking to other engineers about IT topics. He is very self-confidently and knows there are only few people at his company who can level with his skills.

Edison's main responsibility is to ensure the network services meet business requirements. He has influence on the whole network concept, planning the replacement of all IT systems and keeping up to speed with the new technologies. Conception work is the greatest challenge and the greatest pleasure of his job. He has to guarantee a smoothly flow of all replacements, keep the outage-times as low as possible and

not least satisfy the employees of his company by providing a quick network. The network operators have to be involved in all the planning. They need to know exactly which components have to be managed and monitored. Apart from planned outages and replacements, Edison is the first direct contact for the Network Operator in case of unplanned outages. He acts as second level and is only willing to help if the Network Operator has eliminated all possible causes first. Edison thinks he does an above average job and expects the same from a Network Operator. Edison expects a Network Operator to check for the obvious and clarify all open questions before escalating and issue.

#### 4.3.1.3 Peter

| Peter                                                                             |                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Job Role                                                                                                                                                                                                                                                                                                                |
|                                                                                   | Partner Engineer                                                                                                                                                                                                                                                                                                        |
|                                                                                   | Employer                                                                                                                                                                                                                                                                                                                |
|                                                                                   | Partner or Cisco                                                                                                                                                                                                                                                                                                        |
|                                                                                   | Working Hours                                                                                                                                                                                                                                                                                                           |
|                                                                                   | Flexible                                                                                                                                                                                                                                                                                                                |
|                                                                                   | Workplace                                                                                                                                                                                                                                                                                                               |
|                                                                                   | Mobile                                                                                                                                                                                                                                                                                                                  |
|                                                                                   | Job Experience                                                                                                                                                                                                                                                                                                          |
|                                                                                   | Focus on Incidents                                                                                                                                                                                                                                                                                                      |
|                                                                                   | Focus on Operations                                                                                                                                                                                                                                                                                                     |
|                                                                                   | Focus on Projects                                                                                                                                                                                                                                                                                                       |
| Who is Peter?                                                                     |                                                                                                                                                                                                                                                                                                                         |
| Education and Training                                                            | Master of Information Technology or (un-)related Master                                                                                                                                                                                                                                                                 |
| Industry Certifications                                                           | CCIE, CISSP                                                                                                                                                                                                                                                                                                             |
| Job Experience                                                                    | Peter has a great knowledge from a solid education and from frequently attending advanced training updates. He is also engaged in networking in his free time. Through his job role, Peter also has a good overview of the technology and market drivers within his market segment focus.                               |
| Main Goal                                                                         | Sell the concept, win projects, satisfy the customer                                                                                                                                                                                                                                                                    |
| Hobbies                                                                           | Car racing, reading technical magazines, traveling                                                                                                                                                                                                                                                                      |
| Typical Quotes                                                                    | “If the customer is happy, I am too”, “No problem, I’ll handle that”, “Do good and talk about it”                                                                                                                                                                                                                       |
| What is Peter’s Job?                                                              |                                                                                                                                                                                                                                                                                                                         |
| Employer                                                                          | Channel or System Integration Partner<br>Cisco Sales or Services                                                                                                                                                                                                                                                        |
| Typical Job Titles                                                                | Network Consulting Engineer @ Cisco<br>Senior Technical Consultant @ Channel Partner<br>Systems Engineer @ Cisco<br>IT and Networking Architect @ System Integration Partner                                                                                                                                            |
| Responsibilities                                                                  | Depending on the size of the customer – having smaller customers he is responsible for smaller network outages, implementing network components, exchanging hardware, checking end of life notices. When supporting corporate companies he is mostly involved in projects, which are initiated by the customer, seeking |

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | support in specific areas and needing hints or detailed information to components and innovation. Peter has an interest to sell whole concepts to the customer, where greater projects result and a holistic support are needed.                                                                                                                                                                                                                                                                |
| Work Style                          | He has to be very mobile and therefore works with a notebook. He mostly works away from the office, supporting customers and trying to show the customer a way to increase the security of his network. He is on call and if he can make the customer happy he will work in the evenings and on weekends. He uses RDP, telnet, network topology tools, mail and Smart Call Home. One of the most common artifacts he uses are newsletters and security alerts provided by the industry partner. |
| Incidents and Stress                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Dealing with Incidents              | Supporting smaller offices means he acts as the interface between the customer and the industry partner, providing the customer with information and seeking information from the industry partner. Corporate companies usually deal with incidents themselves or seek help directly from the industry partner.                                                                                                                                                                                 |
| Stressful Experiences               | If the customer does not accept the concepts Peter has in mind, if he has overseen something obvious, which the customer detects first, if he has not been informed by the industry partner or has overseen an important security information, which then leads to problems or even outages. Especially if he thinks he is losing appreciation from the customer.                                                                                                                               |
| Peter's use of Smart Call Home      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Main Purpose                        | Check end of life notices, check test completions, check security alerts and advises, update the inventory and include new components to the inventory                                                                                                                                                                                                                                                                                                                                          |
| Dealing with Incidents              | Peter is informed via mail about incidents, about tests, which have failed and security alerts. His main job is to prevent any network outages or minor network problems. He tries to inform the customer about any malpractices before the customer notices.                                                                                                                                                                                                                                   |
| Ongoing Network Operations          | Only when dealing with very small customers, who do not have their own network operators, the partner fulfils this task. Otherwise the customer provides his own network operators.                                                                                                                                                                                                                                                                                                             |
| Project Management and Contribution | This is Peter's most wanted and fulfilling job. In project work he can use all his know-how, coming up with ideal solutions, providing the customer with best practices. This is the job, which really gets his brain going, where he will invest lots of time to come up with a perfect solution.                                                                                                                                                                                              |
| Tools and Artifacts used in Concert | Mail, incident management of the industry partner, phone, telnet, ssh, presentation software, whiteboard, checklists                                                                                                                                                                                                                                                                                                                                                                            |
| Secondary Persona                   | <b>Peter's additional needs stem from the fact that he works with and across multiple customers.</b>                                                                                                                                                                                                                                                                                                                                                                                            |

Peter has a solid background in networking, system integration and software architectures through both his master's study as well as through extensive industry experience. He has always been working for system integrators, initially as part of a project team and then more often in a leading architectural role. Today he is responsible for the architecture of several large key customers with challenging business requirements. His responsibility includes developing and coordinating architectures with the customer and vendor, ensuring the implementation, following but also proposing architectural guidelines, training customer staff on the necessary new skills and help solve customer problems throughout the entire life cycle.

Peter likes to be one step ahead – continuous learning is not a challenge, it is part of this job satisfaction and he likes to be seen as the specialist in his area. Thanks to his experience, analytical skills and his job role which lets him compare multiple customer projects, he can bring real value to his customers even within short time-windows where he is actually collaborating with them.

Being responsible for multiple customers and constantly seeking training, Peter spends most of his work time on the road rather than at his office desk. He also enjoys flexible work hours, which sometimes means spending nights or weekends with a customer, which also gives him the freedom to train for marathon and improve his home automation when it fits best into his personal schedule.

Apart from customer facing responsibilities, providing training is an integral part of his role too. He teaches new technologies or lessons learnt to his junior peers and also delivers professional training courses to a paying audience.

#### 4.3.1.4 Sue

| Sue                                                                                 |                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Job Role                                                                                                                                                                                                            |
|                                                                                     | Support Engineer                                                                                                                                                                                                    |
|                                                                                     | Employer                                                                                                                                                                                                            |
|                                                                                     | Cisco                                                                                                                                                                                                               |
|                                                                                     | Work Hours                                                                                                                                                                                                          |
|                                                                                     | Shift                                                                                                                                                                                                               |
|                                                                                     | Work Place                                                                                                                                                                                                          |
|                                                                                     | Desk / Cube                                                                                                                                                                                                         |
|                                                                                     | Job Experience                                                                                                                                                                                                      |
|                                                                                     | Focus on Incidents                                                                                                                                                                                                  |
|                                                                                     | Focus on Operations                                                                                                                                                                                                 |
|                                                                                     | Focus on Projects                                                                                                                                                                                                   |
| Who is Sue?                                                                         |                                                                                                                                                                                                                     |
| Education and Training                                                              | Bachelor or Master in Information Technology                                                                                                                                                                        |
| Industry Certifications                                                             | CCIE                                                                                                                                                                                                                |
| Job Experience                                                                      | Sue is working on the job since several years. She has gained lots of her skills on the job and in advanced trainings. Sue also frequently attends and sometimes delivers internal product supportability training. |
| Main Goal                                                                           | Find the root-cause – Satisfy the customer                                                                                                                                                                          |
| Hobbies                                                                             | Skiing, music, family                                                                                                                                                                                               |
| Typical Quotes                                                                      | “One down, more to go”, “Nothing is insolvable”                                                                                                                                                                     |
| What is Sue's Job?                                                                  |                                                                                                                                                                                                                     |
| Employer                                                                            | Cisco Technical Assistance Center or Focused Technical Support                                                                                                                                                      |
| Typical Job Titles                                                                  | Customer Support Engineer                                                                                                                                                                                           |

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Responsibilities                    | Sue solves network problems and acts as the last escalation authority. She takes customer calls and executes trouble tickets. Her main duty is to find the best and quickest possible solution to solve the problems and close the tickets. In order to stay focused on incidents she does not accomplish any project work. As the last escalation authority her job experience is superior.                                                                                                                                                        |
| Work Style                          | Sue works shift and therefore shares her pc with a colleague. She and her teammates are very close and managing serious network incidents when working shift demands good communication skills and a transparent and clear hand over when the shift ends. Sues main working instrument is the ticketing tool. In addition she uses the reporting tool to assign the hours to the customer, uses mail and phone to inform the customer, tools such as telnet or network administration and Smart Call Home to check configurations and test results. |
| Incidents and Stress                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Dealing with Incidents              | Dealing with incidents is her main focus.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Stressful Experiences               | Prior shift-workers, which have not handed over the shift with all necessary details. Unknown problems with yet unknown solutions. Uneasy customers. Lack of information.                                                                                                                                                                                                                                                                                                                                                                           |
| Sue's use Smart Call Home           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Main Purpose                        | Check the configuration, check the test results, check user details, adjust the status and adjust any comments regarding problem ticket                                                                                                                                                                                                                                                                                                                                                                                                             |
| Dealing with Incidents              | Sue receives trouble tickets and checks the inventory, the configuration and the test results in Smart Call Home. Smart Call Home is the only possibility to access customer data and device data. Smart Call Home is the common tool for customer and Support Engineer.                                                                                                                                                                                                                                                                            |
| Tools and Artifacts used in Concert | Mail, customer contracts, checklists, manuals to devices, security alerts, service request management, WebEx, release notes, documentations to the customers network                                                                                                                                                                                                                                                                                                                                                                                |
| Secondary Persona                   | <b>Sue is only involved upon real or suspected incidents and has additional needs to effectively and efficiently handle them.</b>                                                                                                                                                                                                                                                                                                                                                                                                                   |

Sue has been working shifts as a customer support engineer for the last 3 years. She owns a bachelor in electrical engineering, took several professional certifications (Cisco CCIE, ITIL, RedHat Linux RHCE) and has gained much of her practical experience when she was working as a network operator for an international company.

In her current job Sue is not only frequently attending courses about the newest technology and products within her focus area – she also ensures to continuously grow her problem solving and communications skills. Every now and then she likes to widen her horizon by taking on new technologies, driving a team initiative or defending a cause because she feels it is just the right thing to do.

It is also her responsibility to share lessons learned with the team, propose improvements to work methodology and tools and to disseminate support information into other groups within the company (such as product engineering, technical sales, etc).

Sue has learnt to be very methodical and rational about gauging the impact of a customer reported problem. While the actual troubleshooting of complex technical issues is what she likes most – she does understand and address the customer's need to be understood and respected and takes every precaution to create a positive and collaborative spirit towards problem resolution. For solving complex problems she often needs to pull together and coordinate a cross-organizational team. Balancing everybody's interest, while still achieving excellent customer satisfaction scores, is a daily challenge.

## 4.3.2 Prototypes

### 4.3.2.1 Overview Page – Dashboard

The dashboard is intended to replace today's Overview, which holds navigation links only by a page, which holds content and overview information. We are also using a navigation structure aligned to the findings from the Card Sorting and Mental Model. Finally to illustrate application experience and better use of screen real estate we provide an example based on the Kubrick style guide.

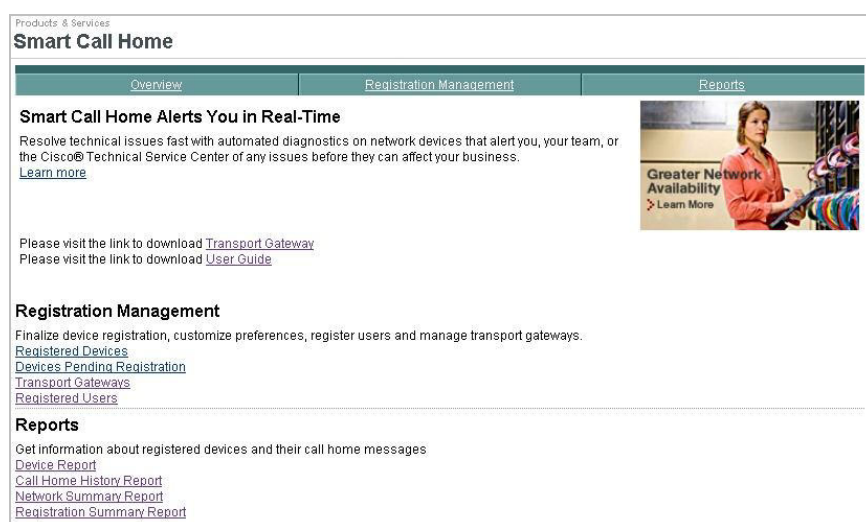


Figure 31 – Existing Overview Page

The actual prototype is developed in three iterations. Iteration 1 aims to find the appropriate navigation structure and content. For this purpose we use simple low-fi prototypes implemented using PowerPoint (content) and Balsamiq (structure), as shown in Figure 32 – Example of Iteration 1 Prototypes.

For the structure and navigation two alternative prototypes are created and compared using a series of Hallway Tests conducted. The first one uses traditional menu bar navigation on top of the content area. This provides slightly more space for the content area, but has the actual menu items overlap with content.

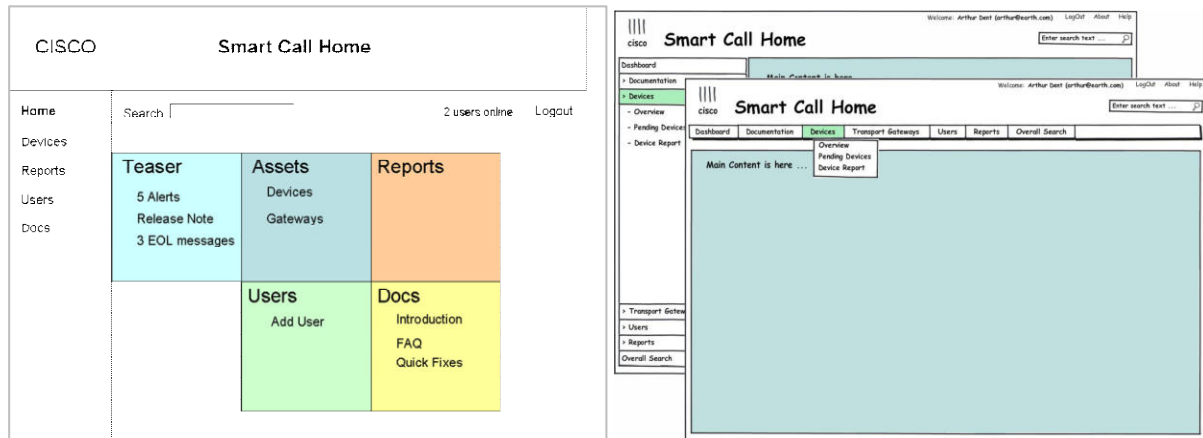


Figure 32 – Example of Iteration 1 Prototypes

The second prototype uses drawer or accordion navigation left of the content area. Tests reveal a preference for the second alternative based on drawer navigation. When asked to locate a specific piece of information, Hallway Test participants were also quicker and more successful using this second alternative.

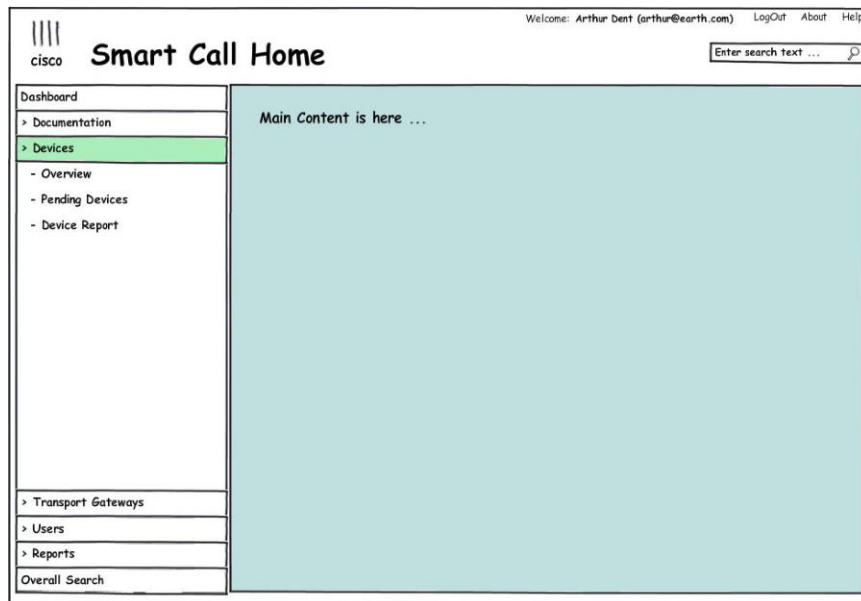


Figure 33 – Iteration 1 Prototype with Drawer Navigation

In a second iteration, those prototypes and the Hallway Testing results were again analyzed and compared against findings and recommendations. Small corrections to the structure were implemented and they were completed with missing elements such as the content representation or the chat function.

The results of this second iteration were then used for a graphical prototype built with the Kubrick Prototyping toolkit based on Microsoft Visio. There is a header area, which includes information about the current user and provides access to the user's profile. Also in the header area are a chat function and an overall search field. Accordion navigation is on the left side of the screen. The main content area of the dashboard includes a filterable, sortable paginated table of devices (as shown in Figure 38 – Prototype of Filterable, Sortable, Paginated Table), an overview of actionable alerts and recent activity as well as a preview. The content of the preview dynamically updates when the mouse pointer moves over the other two sections.

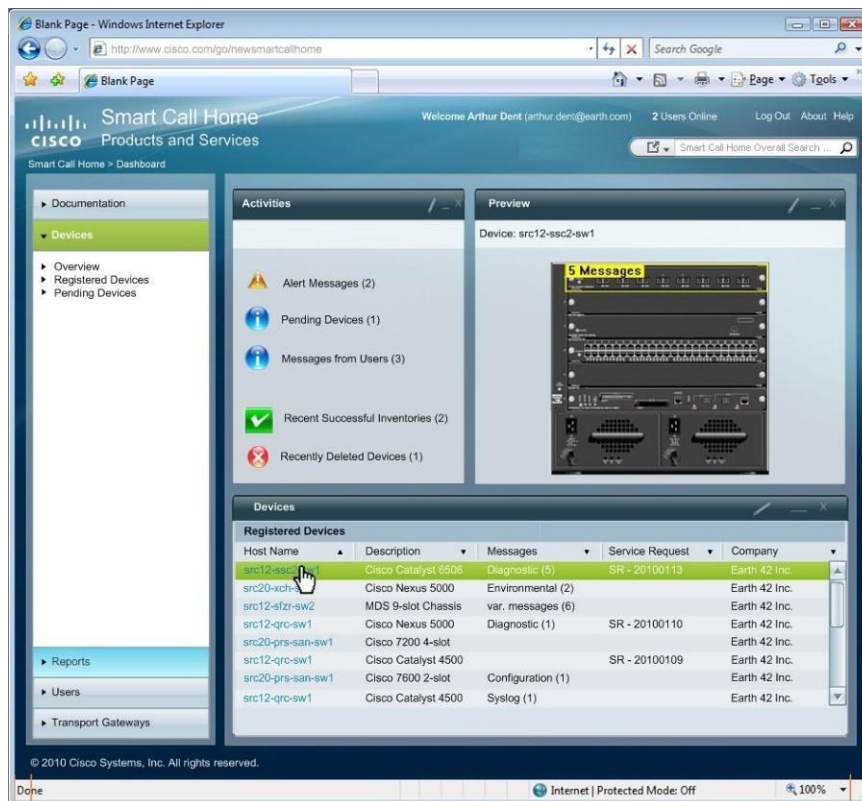


Figure 34 – Iteration 3 Dashboard Prototype using Kubrick – Preview a Device

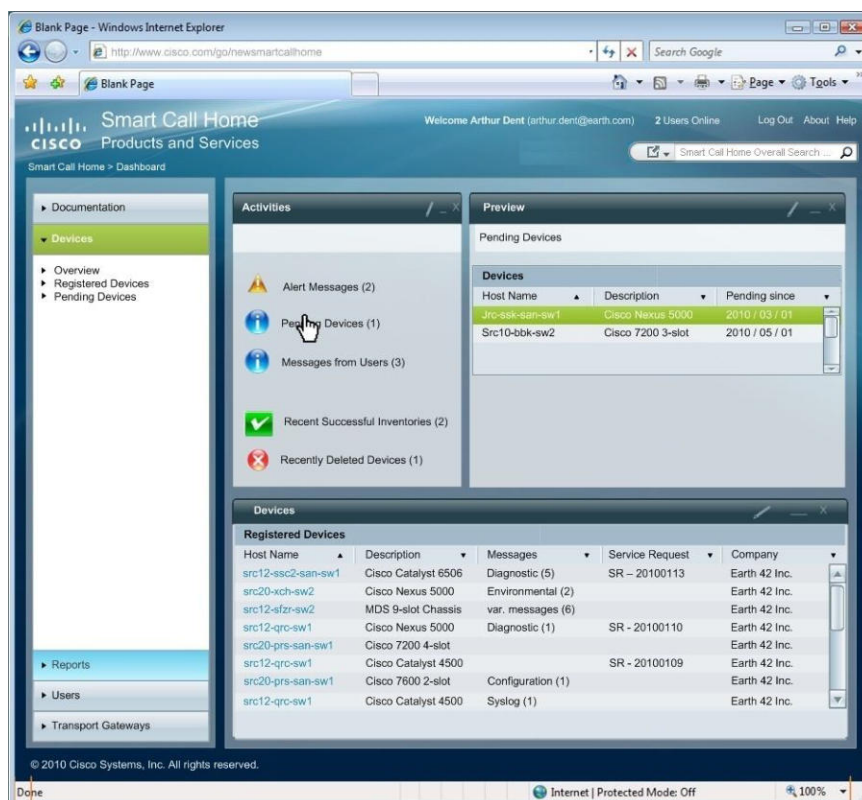


Figure 35 – Iteration 3 Dashboard Prototype using Kubrick – Preview Pending Device Alerts

### 4.3.2.2 Filterable, Sortable, Paginated Tables

In the existing system, most information has to be pulled by the user through search masks within the reports pages. By default no results are shown and search criteria are not re-populated between searches. This contradicts the Mental Model and application concepts of events, messages, alerts, advisories and notification email, which all push relevant information towards the user.

Figure 36 – Existing Call Home History Search Mask

| Serial Number | Host Name        | Time Message Processed (US PST) | Product ID               | Contract Number | Company Name        | Serial Number Entitled | SR Contact  | Message Severity Level | Message Type/Results      | SR Raised/Updated | Notification Sent |
|---------------|------------------|---------------------------------|--------------------------|-----------------|---------------------|------------------------|-------------|------------------------|---------------------------|-------------------|-------------------|
| US11149012H   | Prod_S22-6509-01 | 06-Aug-2009 03:33:46 PM         | WS-C6509-E(DMP-43050-K9) | 1273104         | CISCO SYSTEMS, INC. | Yes                    | PRODUserTwo | 1                      | <a href="#">Inventory</a> | Not Available     | Yes               |

Figure 37 – Existing Call Home History Result Table and Search Mask

By converting today's empty search/report function into pre-populated, filterable, sortable and paginated tables, which are never empty the system becomes more intuitive and efficient to use. Furthermore, reduced size and detail versions of these tables can be used to build the dashboard described in 4.3.2.1 [Overview Page – Dashboard](#). It is essential to ensure the default setting of each table will produce meaningful results (ie.: the most recent messages, the most recently registered devices, etc).

The screenshot shows a web interface for 'Registered Devices'. At the top, it says 'Showing 1-10 of 500' and '20 per page'. Below this is a filter section with 'Filter: Host Name', 'Match if: Contains', and a search box containing 'src'. There are buttons for 'Go' and 'Clear Filter'. The table has five columns: 'Host Name', 'Description', 'Messages', 'Service Requests', and 'Company'. The data rows are as follows:

| Host Name         | Description         | Messages          | Service Requests | Company             |
|-------------------|---------------------|-------------------|------------------|---------------------|
| src12-ssc2-sw1    | Cisco Catalyst 6506 | Diagnostic (5)    | SR - 20100113    | Cisco Systems, Inc. |
| src20-xch-sw2     | Cisco Nexus 5000    | Environmental (2) |                  | Cisco Systems, Inc. |
| src12-sfzr-sw2    | MDS 9-slot Chassis  | var. messages (6) |                  | Cisco Systems, Inc. |
| src12-qrc-sw1     | Cisco Nexus 5000    | Diagnostic (1)    | SR - 20100110    | Cisco Systems, Inc. |
| src20-prs-san-sw1 | Cisco 7200 4-slot   |                   |                  | Cisco Systems, Inc. |
| src12-qrc-sw1     | Cisco Catalyst 4500 |                   | SR - 20100109    | Cisco Systems, Inc. |
| src20-prs-san-sw1 | Cisco 7600 2-slot   | Configuration (1) |                  | Cisco Systems, Inc. |
| src12-qrc-sw1     | Cisco Catalyst 4500 | Syslog (1)        |                  | Cisco Systems, Inc. |

At the bottom right of the table, there are navigation buttons and a page indicator: 'Page 1 of 25'.

Figure 38 – Prototype of Filterable, Sortable, Paginated Table

Another aspect of several tables is that they hold alert information with various levels of urgency and severity. As described in the HCI Expert Review and confirmed by PSS responses, the notion of severity could benefit from some more clarity and visual emphasize. Neither the current Smart Call Home interface nor the current version of Kubrick provide much detail on this topic. There are however standards (such as ITU-T G.783) and existing applications (such as CiscoWorks DFM, Cisco Transport Manager or Cisco Info Center), which describe and implement color schemes for this type of information. This may be worth considering for Smart Call Home messages, recommendations, alerts and advisories.

| Unacknowledged    | Acknowledged      |
|-------------------|-------------------|
| 0 - Clear         | 0 - Clear         |
| 1 - Indeterminate | 1 - Indeterminate |
| 2 - Warning       | 2 - Warning       |
| 3 - Minor         | 3 - Minor         |
| 4 - Major         | 4 - Major         |
| 5 - Critical      | 5 - Critical      |

Figure 39 – Example of Alarm Severity, Status and Colors as used by Cisco Info Center

#### 4.3.2.3 Overall Search Function

In the existing system, search is segmented on a per report basis. When a user is not certain where to look for information or when matching information from multiple categories is being searched for, this can be cumbersome to use. An overall full-text search across all information is therefore desirable. A quick access search field may always be visible as part of the navigation (ie.: top-right corner of the dashboard). The actual search field holds the search mask on top and results at the bottom. Results could be presented either in a single web-style list (similar to the way in which popular search engines display results) or in dedicated tables per asset type.

While both approaches are certainly viable, the feedback received during Hallway Testing suggests there may be a preference for separate tabular results. Tabular results in separate containers could also offer the capability to minimize results outside the scope of the search or maximize the relevant result type. In any case, a notion of relevance should be established and a navigation path to the dedicated content area for the type of information found must be provided.

**Overall Search**

Tim  [Advanced Search Options](#)

Search for: ☒ Devices ☒ Messages ☒ Gateways ☒ Users

465 Items found Showing 1-10 of 456 100 per Page

| Type    | Name           | Description                                     |
|---------|----------------|-------------------------------------------------|
| User    | Tim Johnson    | tims-uid Cisco Systems                          |
| Device  | tim-dca01      | N7K-C7010 0123456ABC Nexus 7000 10 Slot Chassis |
| Device  | tim-dca02      | N7K-C7010 0123456KLM Nexus 7000 10 Slot Chassis |
| Device  | tim-dcb01      | N7K-C7010 01234566HI Nexus 7000 10 Slot Chassis |
| Message | tim-dca01      | Inventory 05-Jan-10 09:35 AM                    |
| Message | tim-dca02      | Inventory 05-Jan-10 09:30 AM                    |
| Message | tim-dcb01      | Diagnostic 05-Jan-10 03:30 AM                   |
| Device  | cec4-zrh       | N7K-C7010 0123TIM789 Nexus 7000 10 Slot Chassis |
| User    | Peter Innocent | petes-uid Untimely Solutions Inc.               |
| Message | cec4-zrh       | Environment 04-Jan-10 11:30 AM                  |
| Message | cec4-zrh       | Configuration 04-Jan-10 11:28 AM                |
| ...     | ...            | ...                                             |
| ...     | ...            | ...                                             |
| ...     | ...            | ...                                             |
| ...     | ...            | ...                                             |
| ...     | ...            | ...                                             |
| ...     | ...            | ...                                             |
| ...     | ...            | ...                                             |
| ...     | ...            | ...                                             |
| ...     | ...            | ...                                             |

Page 1 of 5

**Overall Search**

Tim  [Advanced Search Options](#)

Search for: ☒ Devices ☒ Messages ☒ Gateways ☒ Users

7 Devices found

| Hostname  | Serial Number | Product ID | Description                |
|-----------|---------------|------------|----------------------------|
| tim-dca01 | 0123456ABC    | N7K-C7010  | Nexus 7000 10 Slot Chassis |
| tim-dca02 | 0123456KLM    | N7K-C7010  | Nexus 7000 10 Slot Chassis |
| tim-dcb01 | 01234566HI    | N7K-C7010  | Nexus 7000 10 Slot Chassis |
| cec4-zrh  | 0123TIM789    | N7K-C7010  | Nexus 7000 10 Slot Chassis |

456 Messages found Showing 1-10 of 456 10 per Page

| Hostname  | Severity | Message Type  | Time Received      |
|-----------|----------|---------------|--------------------|
| tim-dca01 | 3        | Inventory     | 05-Jan-10 09:35 AM |
| tim-dca02 | 3        | Inventory     | 05-Jan-10 09:30 AM |
| tim-dcb01 | 1        | Diagnostic    | 05-Jan-10 03:30 AM |
| cec4-zrh  | 2        | Environment   | 04-Jan-10 11:30 AM |
| cec4-zrh  | 2        | Configuration | 04-Jan-10 11:28 AM |

No Transport Gateways found

2 Users found

| Name           | User DI   | Company                 |
|----------------|-----------|-------------------------|
| Tim Johnson    | tims-uid  | Cisco Systems           |
| Peter Innocent | petes-uid | Untimely Solutions Inc. |

Figure 40 – Wireframe Prototypes for Overall Search



# 5 Results and Discussion

## In This Chapter

The result contains findings and recommendations to Smart Call Home, listing every finding using criteria of usability aspects and plausibility. You will find figurative explanations and low-fi prototypes to emphasize the conclusion. The content of this chapter is the outcome of applied methods and builds the headstone for future work.

## 5.1 Discussion of Hypothesis H2 – Context of Use

Hypothesis H2 has been articulated within the project objectives as follows:

|            |                                                                                                                                                                                       |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Assumption | Some features are used in normal office contexts while other features may be used in labs, on site, under stress, multi-tasking and with poor ambient conditions (light, noise, etc). |
| Hypothesis | The current interaction structure and concept accurately support system use within the relevant contexts.                                                                             |
| Antithesis | The current interaction structure and concept do not accurately support system use within the relevant contexts.                                                                      |

Table 14 – Hypothesis H2 – Context of Use

As described in 3 [Methodology](#) and 4 [Completed Work](#) a broad set of methods and work items have been used to collect facts, which are either supporting or refuting thesis H2. Furthermore the work completed in 4.2 [Dealing with Stress](#) provides additional detail related to stressful aspects of the context in which Smart Call Home is being used.

After bringing it all together, we have enough evidence to draw a balance. We have come to the conclusion that we have to refute hypothesis H2 and support antithesis H2 instead: The current interaction structure and concept do not accurately support system use within the relevant contexts.

According to the Survey and PSS results, users and potential users of Smart Call Home do indeed experience stress on their job as well as negative context aspects such as poor working conditions, varying tools and expectations and inconsistent availability of information. Stressful situations are typical for the every day life of Smart Call Home users. According to the conclusions especially stress as the main context focus of this study project is not supported accurately by Smart Call Home. There are many optimizations still possible in order to support the user during stressed situations and prevent the user from contributing factors to ease his day-to-day business. Areas of optimizations are the structure, which can be optimized to support the common concepts of the Mental Model of the users and to ensure an ideal task flow; the behavior of links, popups or navigation to ease the usage of these elements and the general navigation; the presentation, to ensure the affordance of actions and choose deliberate naming and styling. All findings and recommendations listed in this work support the user in both stressed and relaxed states. They contribute in any rate to a user-centered design and an increased user acceptance.

## 5.2 Findings and Recommendations

Multiple options exist for presenting an inventory of findings and recommendations. They could be structured by HCI criteria or by product management and engineering criteria. To allow for sorting and prioritization based on a combination of criteria while still keeping things simple and transparent we have chosen to implement a weighting scheme.

Furthermore, the first letter of ID assigned to each finding and recommendation indicates whether the effect of the recommendation is structural (Snn), behavioral (Bnn) or limited to presentation (Pnn). This is done in analogy to Mandel's <sup>[MT97]</sup> iceberg chart definitions.

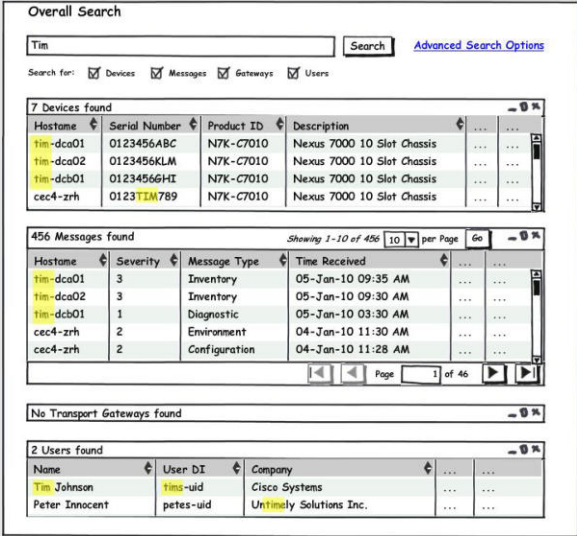
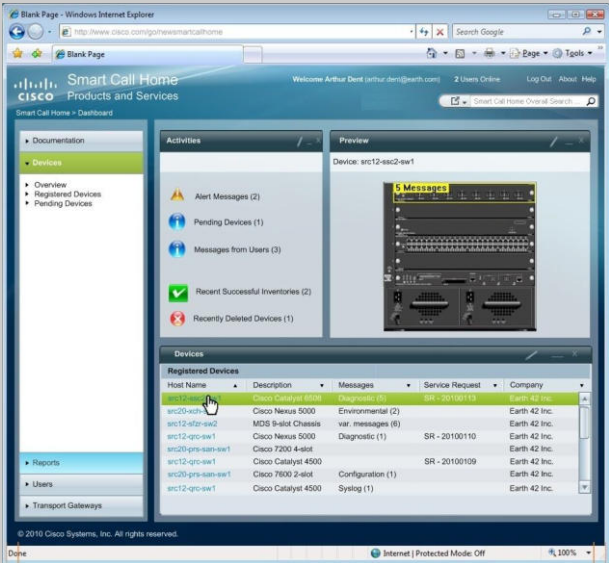
### 5.2.1 Weighting Schema

The findings and recommendations are evaluated using a simple weighting schema. This allows the findings and recommendation inventory to be sorted based on total weight. The following factors are included in the weighting schema:

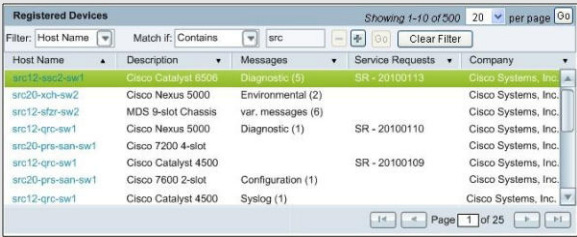
- **I – Importance:** describes the importance or significance from a HCID perspective, answering the question: how significant is the improvement for the user experience? (1 = low, 2 = medium, 3= high)
- **M – Mitigating Stress:** contribution towards mitigating negative effects of stress. (1 = low, 2 = medium, 3= high)
- **P – Plausibility:** describes the likelihood of a finding to be valid for a wider user population – based on how many methods and/or how many individual work items support the finding and recommendation (1 = low, 2 = medium, 3= high)
- **A – Alignment:** describes the alignment with product strategy, vision and execution – this factor can be assigned by product management upon transition phase. (1 = low, 2 = medium, 3= high)
- **C – Cost:** describes the inverted effort or cost required to implement – this factor can be assigned by engineering upon transition phase (1 = high cost, 2 = medium, 3 = low cost)
- **T – Total:** is the calculated total weight (sum of all weighting factors)

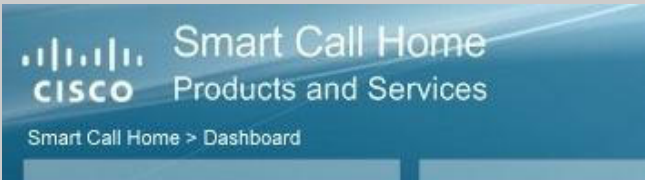
Once completed by product management and engineering – the weighted inventory of findings and recommendations will facilitate identification and selection of measures which have a favourable benefit to effort ratio.

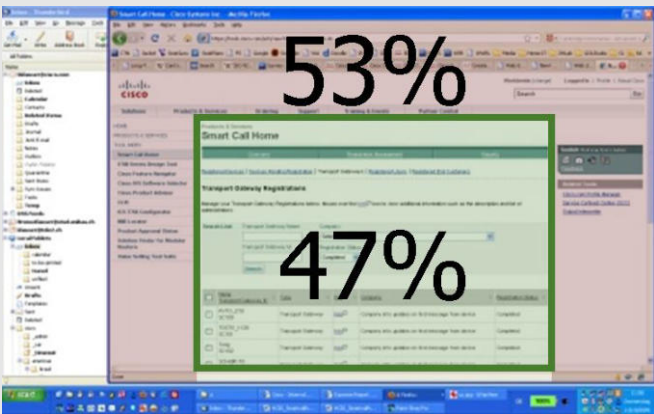
## 5.2.2 Inventory

| ID  | Finding<br>→ Recommendation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | References                                                                    | I | M | P | A | C | T |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---|---|---|---|---|---|
| S04 | <p>Functionality: No overall search or site map available and vast amount of information across 2 to 3 levels of navigation.</p> <p>→ help the user find the relevant information by providing a search field (on data and on labels), an index or a site map. This is illustrated by a prototype in 4.3.2.3 Overall Search Function.</p>                                                                                        | Contextual<br>Inquiries,<br>Stress, UI<br>Map                                 | 3 | 3 | 3 |   |   | 9 |
| S05 | <p>Structure: the ‘overview’ page is the most often used page, the first page visible upon login but does not provide much information today apart from (redundant) navigation links.</p> <p>→ Provide a (customizable) overview page which includes the most relevant data points, recent changes (in content and format), due activities, statuses, etc.</p>  <p>For more details, see 4.3.2.1 Overview Page – Dashboard.</p> | ER10,<br>Task Flow<br>Heatmap,<br>Card<br>Sorting,<br>Contextual<br>Inquiries | 3 | 3 | 3 |   |   | 9 |

| ID  | Finding<br>→ Recommendation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | References                                                     | I | M | P | A | C | T |   |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---|---|---|---|---|---|---|
| S01 | <p>Functionality: List of recommended actions cannot easily be used as a checklist and does not include information about other administrators who may be (or have been) working on it too.</p> <p>→ Add checkboxes, user name, time stamp and free form text field upon checking an item. Optionally link this with Service Request status updates.</p> <div><p><b>Problem Details</b></p><p>WS-C3509-E with Host Name Prod_Cat5503-01 and Supervisor WS-SUP720-3BKX reported OOLD Diagnostics test failure:</p><p>TestE_VlanMap on module WS-X6548-RJ-45 in slot 2 in US11149012H<br/>TestIngressSpan on module WS-X6548-RJ-45 in slot 2 in US11149012H<br/>TestFirmwareDiagStatus on module WS-X6548-RJ-45 in slot 2 in US11149012H<br/>TestLoopback on module WS-X6548-RJ-45 in slot 2 in US11149012H</p><p><b>Recommendation Checklist:</b></p><p>These were multiple test failures in module 2 that very possibly have a single root cause. Take the following steps to resolve the failure:</p><ul style="list-style-type: none"><li>• Multiple test failures in module 2. This indicates either a faulty module or a module that is incorrectly seated.</li><li>• Reseat module 2 firmly and make sure the screws are securely tightened.</li></ul><p><input checked="" type="checkbox"/> Completed by: Arthur Dent (arthur.dent@earth42.com) on: Tuesday Jan 19th 2010<br/>Comment: I just did this, bottom screw was missing though, and error persists Arthur</p><p>• Move the module to a known good working slot on the same chassis or a different chassis. If the module passes the test in a different chassis, this could indicate a faulty chassis or a module that is inserting an indirect fault.</p><p><input checked="" type="checkbox"/> Completed by: Arthur Dent (arthur.dent@earth42.com) on: Tuesday Jan 19th 2010<br/>Comment: Moved to slot 3, same result, moved it back into slot 2</p><p>• Rerun the test using the 'diagnostic start' command to ensure that the test continues to fail.</p><p><input type="checkbox"/> Comment: <input type="text"/> <input type="button" value="Submit"/></p><p>• If the problem continues to occur, replace module 2<br/>The recommendation for each individual test failure is listed in the individual result below in case further troubleshooting is required</p></div> | Stress,<br>Task<br>Inventory,<br>Personas:<br>Oscar and<br>Sue | 3 | 2 | 3 |   |   |   | 8 |
| S02 | <p>Functionality: upon alerts and recommendations, there is no information about prior/similar problem solving approaches provided. This adds to the Perceived Stress Factor of feeling left alone.</p> <p>→ Harvest user intelligence/crowdsourcing to and provide anonymized resolution information (other users with this device/problem have done xyz). This could complement S01.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Stress,<br>PSS,<br>Personas:<br>Oscar,<br>Edison and<br>Peter  | 2 | 3 | 3 |   |   | 8 |   |
| P11 | <p>Presentation: all information is displayed in table format only, making it difficult and potentially error-prone to map to real-world hardware</p> <p>→ Provide summary information as an overlay to graphic device views (similar format as CiscoView). As illustrated below, a graphical device representation could highlight modules affected by recent or un-acknowledged Smart Call Home messages.</p> <div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Stress<br>(Body and<br>Mind),<br>Background<br>research        | 3 | 3 | 2 |   |   | 8 |   |

| ID  | Finding<br>→ Recommendation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | References                                                           | I | M | P | A | C | T |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|---|---|---|---|---|---|
| S03 | <p>Functionality: no status information of service request ticket provided and link only available from within report results, Also there is no information provided to see if a request was created manually or automatically</p> <p>→ Enable a more direct integration with service requests, provide service request status info and quick link to access service requests, optionally combine with S01, see also 4.3.2.1 <a href="#">Overview Page – Dashboard</a>.</p>                                                                                             | ER07<br>Contextual<br>Inquiries<br>Stress                            | 3 | 3 | 2 |   |   | 8 |
| P14 | <p>Information presentation: today some content functions start with a search mask on an empty screen. There is a high risk of wrongly concluding that information doesn't exist.</p> <p>→ Make use of pre-populated, filterable, sortable, paginated tables to support the user and simplify the task of finding relevant information.</p>  <p>See 4.3.2.1 <a href="#">Overview Page – Dashboard</a>.</p>                                                                            | CIa1, CIId1,<br>CIe1,<br>Survey,<br>Stress, Task<br>Flow<br>Heatmap  | 2 | 3 | 3 |   |   | 8 |
| P04 | <p>Presentation: Some interactions with Smart Call Home are initiated while the user is not at his primary work location. Also a subset of recommendations may lead to hardware interactions (such as re-seating or replacing a module).</p> <p>→ Consider offering (a subset of) Smart Call Home functionality for mobile use (see also P11 and P13).</p>  <p>See also: <a href="http://people.cisco.com/bklauser/qr/sch.html">http://people.cisco.com/bklauser/qr/sch.html</a></p> | Survey,<br>Task<br>Inventory,<br>Personas,<br>Background<br>research | 3 | 3 | 2 |   |   | 8 |

| ID  | Finding<br>→ Recommendation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | References                                                          | I | M | P | A | C | T |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|---|---|---|---|---|---|
| S09 | <p>Information Consistency: The availability and level of detail of specific alerts depends on many factors, including:</p> <ul style="list-style-type: none"> <li>▪ Device type and version</li> <li>▪ Device software version</li> <li>▪ Cisco product and product line information</li> <li>▪ Customer's device configuration</li> <li>▪ Customer's Transport Gateway configuration</li> </ul> <p>This leads to a vast number of varying levels of information being available for specific devices. Furthermore the actual level of detail available for a specific device is not obvious to a user. Users have also expressed that 'inconsistent level of detail' or too much, irrelevant or misleading information is a key issue. This is also backed up by the fact that information recognition and processing capabilities tend to degrade under stress.</p> <p>→ Consider introducing a finite set of defined levels of Smart Call Home adoption, indicate for each registered device what it's current and maximum levels are – and make it clearly visible what can be expected from a device fitting into a specific level.</p> | Background Stakeholder Interview, Stress, Contextual Inquiries, PSS | 2 | 3 | 3 |   |   | 8 |
| P02 | <p>Navigation: No information about current position.</p> <p>→ Provide breadcrumb navigations.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ER01, ER22, ER48,                                                   | 3 | 2 | 2 |   |   | 7 |
| B03 | <p>Functionality: Date/Time Picker provides invalid default values and accepts invalid date ranges (such as: start date in the future – ahead of current processing time, end date before start date, excessive date ranges, etc.).</p> <p>→ Limit selection to valid date ranges (such as 3 months) and provide reasonable default values.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ER44, CIc1, Stress                                                  | 2 | 2 | 3 |   |   | 7 |
| B05 | <p>Navigation: some table entries show a popup icon, even though the popup is empty. Advisory pop-ups in the device reports on the other hand are only shown if the popup contains information.</p> <p>→ Provide links/pop-ups if there is information, list greyed-out links/pop-ups if there is no information. Don't provide empty pop-ups or simply hide links.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ER49, Stress, Background research, CIa1                             | 2 | 2 | 3 |   |   | 7 |

| ID  | Finding<br>→ Recommendation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | References                                  | I | M | P | A | C | T |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---|---|---|---|---|---|
| S07 | <p>Message Handling: reports include a severity level without explanation.</p> <p>→ Provide a legend, consider adding a dropdown filter capability, this also relates to B10. Consider color codes based on severity. See also Figure 39 – Example of Alarm Severity, Status and Colors as used by Cisco Info Center.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ER46,<br>CIa1,<br>Survey                    | 2 | 2 | 3 |   |   | 7 |
| P07 | <p>Navigation: some pages do not include second level navigation and information about current position.</p> <p>→ Provide navigation links consistently and provide breadcrumb navigation. See also P02.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ER21,<br>ER22                               | 2 | 2 | 2 |   |   | 6 |
| P13 | <p>Presentation: screen ‘real-estate’ of web application users is limited – they often access it from notebooks and use multiple other applications in parallel. With the web application confined inside Cisco.com layout, this leads to excessive scrolling and large unused screen areas. It also leads to distraction and confusion of navigation and search elements.</p>  <p>As illustrated above, in a typical screen and browser configuration the area usable for Smart Call Home is below 50% of the total browser area occupied on the screen.</p> <p>→ Provide a ‘detach’ option to launch the web application into a separate browser window with no toolbars and no clutter. This could be similar to what <a href="http://www.cisco.com/go/fn">www.cisco.com/go/fn</a> uses. See Prototype 4.3.2.1 Overview Page – Dashboard.</p> | ER08<br>Moodboard<br>Background<br>research | 2 | 2 | 2 |   |   | 6 |
| P16 | <p>Navigation: Links within Popups can be difficult to click, depending on popup size, mouse settings and user’s fine motor skills.</p> <p>User quote: ‘this popup keeps running away from me.’</p> <p>→ Consider alternatives, or provide an attach link (similar to a speech bubble).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CIcI,<br>Background<br>research             | 2 | 2 | 2 |   |   | 6 |

| ID  | Finding<br>→ Recommendation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | References                                                 | I | M | P | A | C | T |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---|---|---|---|---|---|
| S06 | <p>Message Handling: the current application does not provide state handling of messages. However, other applications used in concert with Smart Call Home make extensive use of such concepts:</p> <ul style="list-style-type: none"> <li>Email: (un-)read</li> <li>Troube Ticketing (un-)assigned</li> <li>Network Management acknowledge, clear events</li> </ul> <p>Such state handling facilitates overview and dashboard functionality (ie.: new messages) as well as team collaboration (ie.: is anyone working on this already?) and corporate learning (ie: what was the resolution path / history)</p> <p>→ Implement a state model for Smart Call Home messages and leverage it in overview, dashboard and collaboration functionalities. See also S01 and 4.3.2.1 <a href="#">Overview Page – Dashboard</a>.</p> | Contextual Inquiries, Background research                  | 2 | 2 | 2 |   |   | 6 |
| B08 | <p>Peer chat or messaging functionality is a concept exhibited by multiple methods but not available today. Also peer collaboration is an integral part of several overall tasks for which Smart Call Home is being used.</p> <p>→ Consider adding functionality to display online/offline status information about peers, engage in live chat or in messaging.</p>  <p>See also header section of the Dashboard prototypes.</p>                                                                                                                                                                                                                                                                                                          | Survey, Card Sort, Stress, Contextual Inquiries            | 1 | 3 | 2 |   |   | 6 |
| P12 | <p>Documentation: Some new features of the web application are 'hidden' at second or third level navigation, unlikely to be noticed by existing users (example: recent introduction of config sanity analysis)</p> <p>→ Educate users via hint and link to release notes on the dashboard/main overview page. This could be achieved via an email update or a 'getting started' page, as proposed by Kubrick.</p>                                                                                                                                                                                                                                                                                                                                                                                                            | Stakeholder Interview, Stress, Background research, UI Map | 2 | 1 | 2 |   |   | 5 |

| ID  | Finding<br>→ Recommendation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | References                                                           | I | M | P | A | C | T |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|---|---|---|---|---|---|
| P09 | <p>Navigation: pop-ups from within table entries cannot easily and uniquely be associated to the correct table row once they have been opened.</p>  <p>→ Attach them to their launch point using a speech bubble approach or avoid entirely</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                | CId1                                                                 | 2 | 2 | 1 |   |   | 5 |
| S08 | <p>Direct access to device information: Upon recommendations, which lead to hardware interaction, accurate device identification is critical. Also upon hardware interactions not primarily driven by Smart Call Home casual use of Smart Call Home provides valuable information.</p> <p>→ Enable quick, easy and accurate access to a specific device's Smart Call Home information. Consider leveraging serial number bar codes and/or Mobile Asset Tags.</p>  <p>See <a href="http://m.cisco.com/mat/">http://m.cisco.com/mat/</a> and <a href="http://zed.cisco.com/confluence/display/EUTMO/Mobile+Asset+Tags">http://zed.cisco.com/confluence/display/EUTMO/Mobile+Asset+Tags</a></p> | Survey,<br>Task<br>Inventory,<br>Personas,<br>Background<br>research | 2 | 2 | 1 |   |   | 5 |

| ID  | Finding<br>→ Recommendation                                                                                                                                                                                                                                                                                         | References                                   | I | M | P | A | C | T |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|---|---|---|---|---|---|
| B07 | Navigation: There is a link from [Registration Summary Report] to [Device Report] – but not directly to [Device Details] – and there is no equivalent link from [Registered Devices] to [Device Details].<br><br>→ Add direct links from both results and clearly label them instead of using data as the link text | UI Flow ,<br>Map and<br>Task Flow<br>Heatmap | 2 | 1 | 2 |   |   | 5 |
| P01 | Navigation: Dual mention of main menu items (menu bar and overview page).<br><br>→ Either provide additional information for redundant links or make better use of this space. Redundant links are more useful if they use complementary information or visual appearance. See also S05.                            | Background<br>research                       | 2 | 1 | 1 |   |   | 4 |
| P03 | Style: Inconsistent font/size/color for links<br><br>→ Standardize color scheme and make consistent use of it throughout all areas.                                                                                                                                                                                 | ER02                                         | 2 | 1 | 1 |   |   | 4 |
| P05 | Style: Inconsistent use of UI components – Dropdown vs. Text Field (ie.: for selection of ‘Company’)<br><br>→ Make consistent use of interaction elements. Potentially implement the type of element depending on the actual number of choices available.                                                           | ER29                                         | 2 | 1 | 1 |   |   | 4 |
| B06 | Functionality: Search options for users include Cisco.com ID and registration status – but not a user’s real first and/or last name.<br><br>→ Provide consistent user search functionality (choice of real name or ID).                                                                                             | ER30                                         | 2 | 1 | 1 |   |   | 4 |
| B09 | Apparently upon expiration of a support contract, devices are automatically de-registered and have to be manually re-enrolled for Smart Call Home.<br><br>→ Ensure advanced warning notification and consider ‘inactive’ state rather than de-registering.                                                          | CIa1, Stress                                 | 1 | 2 | 1 |   |   | 4 |
| P15 | Combination of HTTP and HTTPS content within the same browser window leads to security alerts on the client side. This causes distraction and uncertainty.<br><br>→ Eliminate warnings by making consistent use of HTTPS (this also relates to Finding and Recommendation P13)                                      | CIc1                                         | 2 | 1 | 1 |   |   | 4 |

| ID  | Finding<br>→ Recommendation                                                                                                                                                                                                                                                                                                                                                                                                                  | References                    | I | M | P | A | C | T |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---|---|---|---|---|---|
| B10 | Trust, Relevance and False Positives: users need the confidence that they can rely on Smart Call Home to alert them of any problem. To achieve this, a certain level of false positives may not be avoidable. However, they reduce the user's confidence.<br><br>→ Consider reporting a probability or relevance indicator, based on how likely a Smart Call Home alert is valid?                                                            | CIc1, Stress, Survey          | 2 | 1 | 1 |   |   | 4 |
| B01 | Functionality: Inconsistent functionality for the various table reports – ie.: pdf/xls export not always available.<br><br>→ Provide consistent export functionality.                                                                                                                                                                                                                                                                        | ER03                          | 1 | 1 | 1 |   |   | 3 |
| B02 | Functionality: No logout option available.<br><br>→ Provide logout function and/or provide session timeout information. See also S05.                                                                                                                                                                                                                                                                                                        | Background research, ER07     | 1 | 1 | 1 |   |   | 3 |
| B04 | Functionality: Date/Time Picker granularity (minutes) does not match display granularity (seconds).<br><br>→ Provide consistency.                                                                                                                                                                                                                                                                                                            | ER44                          | 1 | 1 | 1 |   |   | 3 |
| P06 | Navigation: Links of the second level navigation changes the order (ie.: Network Summary vs. Registration Summary Report).<br><br>→ Order consistently and provide breadcrumb navigation.                                                                                                                                                                                                                                                    | ER40                          | 1 | 1 | 1 |   |   | 3 |
| P08 | Style: Inconsistent use of table popup vs. expand and collapse function vs. links to sub pages.<br><br><br>→ Make consistent use of navigation elements.                                                                                                                                                                                                  |                               | 1 | 1 | 1 |   |   | 3 |
| P10 | Functionality: The notify and re-notify pending registration emails include a hostname only, which can be ambiguous under certain conditions (gateway.sydney.acme.com vs. gateway.zurich.acme.com vs. gateway.ngo.org).<br><br>→ Add fully qualified domain name and/or serial number and/or company name and/or service contract identifier. Consider adding (some of) this information to the subject line too, enabling easier filtering. | Background research, Personas | 1 | 1 | 1 |   |   | 3 |

Table 15 – Inventory of Findings and Recommendations



## 6 Future Work

### In This Chapter

Findings and results have been described earlier; now precise suggestions on how to continue and take advantage of this work come to the fore. You will find out which job roles can be involved in the next steps and what tasks are to be performed in the near future and on longer-term. After all – what use are recommendations for optimizations if the question to how the recommendations are implemented is left open.

### 6.1 Implementation of Recommendations

The biggest benefit of this work to Cisco is to have the opportunity to evolve Smart Call Home into a user centered, user friendly application, with an obvious added value for network and device management. By implementing even a subset of the recommendations for the significant findings, the user will appreciate and become aware of the improved usability of Smart Call Home.

#### 6.1.1 Prioritization of Findings and Recommendations

The first decision to be taken by Cisco Smart Call Home product management is around prioritization of the recommendations. The A and C metric introduced in the inventory of findings and recommendations in 5.2.1 Weighting Schema are designed to facilitate a prioritization dialog between product management and engineering. Together with the first three columns, which have been pre-populated already, a total weight can be calculated for each recommendation. Sorting the table based on total weight should provide a clue about appropriate prioritization.

When discussing the prioritization of recommendations, engineering is encouraged to share their expertise on possible design solutions. If there is time, prototypes can be created and usability tests can be executed to ensure and validate a user centered approach and increase user satisfaction. The more the user is integrated in the development and design process, the greater the acceptance of Smart Call Home will be.

#### 6.1.2 Tracking Implementation

Once findings and recommendations have been reviewed and prioritized, they can be incorporated in the roadmap for Smart Call Home. There is no doubt the roadmap needs to take into account other factors such as availability of resources, other requirements, market and adoption drivers, etc. To ensure real progress is being made regarding the implementation of findings, product management could consider tracking the recommendations that they have agreed to implement. Baxter and Courage<sup>[BC05]</sup> propose to use a “usability scorecard” to track this information. The scorecard indicates which recommendations have been made, accepted and eventually implemented. Using the scorecard implies that in future user-centered methods are chosen to identify usability problems. The recommendations resulting from the accomplished methods are discussed in the team and some of which are agreed on and implemented. Depending on the difference of amount of recommended actions, accepted actions and implemented actions, the risk of the usability of the product is determined.

| Product and Release | Product Manager | Recommendations |                |                |          | Risk   |
|---------------------|-----------------|-----------------|----------------|----------------|----------|--------|
|                     |                 | Provided        | Concept Commit | Execute Commit | Released |        |
| Smart Call Home n.0 | name@cisco.com  | 12              | 10             | 10             | 9        | low    |
| Smart Call Home n.1 | name@cisco.com  | 10              | 10             | 10             | ...      | low    |
| Transport Gateway m | name@cisco.com  | 2               | 2              | ...            | ...      | medium |
| Smart Call Home n.2 | name@cisco.com  | 8               | 7              | ...            | ...      | high   |
| ...                 | ...             | ...             | ...            | ...            | ...      | ...    |
| ...                 | ...             | ...             | ...            | ...            | ...      | ...    |

Table 16 – Example of a Usability Scorecard

The Inventory of Findings and Recommendations could easily be adapted to include scorecard information. The scorecard is a good instrument to give executives an at-a-glance view of the state of usability of Smart Call Home.

## 6.2 New Questions Raised

### 6.2.1 Software Integration Interfaces

Smart Call Home today provides human interaction interfaces to users outside Cisco exclusively. While our focus did include other artifacts and tools used in concert with Smart Call Home, there remain some open questions and new questions have been raised. Indicators of questions which deserve some further exploration include:

- Diverse set of tools in context: from the observations, interviews and Contextual Inquiry there is a long and rather diverse list of individual tool, which are used in concert with Smart Call Home. Depending on the actual task, this list varies heavily (ie.: element- and network management systems (EMS, NMS) may be used for other tasks than a trouble ticketing system (TTS) or an IT service assurance system.
- Divergence between Stakeholder statement and Observations: our understanding of how the Stakeholders see this topic is slightly different from what the observations seem to suggest. Product management Stakeholders indicate a focus on further diagnostic capabilities and leverage of EMS and NMS systems. Observation of users on the other hand suggests that enrollment, asset management and trouble ticketing systems may have a more direct relation to today's use of Smart Call Home
- Near future device adoption: lower-end routing platforms which are planned to adopt Smart Call Home in the near future may add additional context characteristics and tools to those analyzed in this project. Many customers have between 1 and a few dozen large devices enrolled in Smart Call Home today. Customers enrolling thousands or tens of thousands of low-end devices in the near future are likely to use different operational procedures and tools.

Observations, findings and recommendations on this topic are documented in 4.1.3 About Context and 5.2 Findings and Recommendations as well as in the Remote Contextual Inquiry transcripts. Due to the above questions we do recommend that this topic is analyzed in further detail.

## 6.3 Beyond the Scope

### 6.3.1 International and Cross-Cultural Adoption

Smart Call Home today is already globally available and adopted by customers from various market segments and based in 20 different countries across continents. Diversity is expected to increase in the near future as Smart Call Home is adopted by customers in other countries. While the majority of devices supported today are at the high-end, upcoming support will include low-end devices. This will extend the addressable market and involve customers with different procedures and culture.

This means that accurately supporting Smart Call Home adoption is likely to reach beyond the typical Internationalization (I18N) and Localization (L10N) aspects often cited.

During this project we have taken care not to involve too much bias. Due to the limited regional coverage and small sample sizes however, we cannot exclude bias completely. Furthermore we have not explicitly analyzed cross-cultural implications which may exist.



# 7 Lessons Learnt

## In This Chapter

It is one of our goals to learn and benefit as much as we can from this project for us Personally and for our future work. We would also like to share our key observations and lessons with you. You will find our thoughts about the usefulness of chosen methods and their contribution towards the objectives, about teamwork and consequential decisions.

## 7.1 Observations and Lessons

This project has been a great learning experience. We've been able to practice and confirm what we've learnt in theory – and we also came across the unexpected and the new. The scope of this project allowed for a holistic view of the principal components of human-machine interaction. For the first time we had the opportunity to combine and integrate methods from both requirements engineering and interaction Design in a single project. We believe the findings and recommendations are supported by many of these methods. Every single artifact contributed to the findings and recommendations and our Personal learning success. Describing current scenarios and identifying new scenarios was the main goal of this project. In our opinion this goal is attained. The scenarios are documented in the chapter results and discussion. They are illustrated by several low- and hi-fi prototypes, making it easier to understand our train of thoughts.

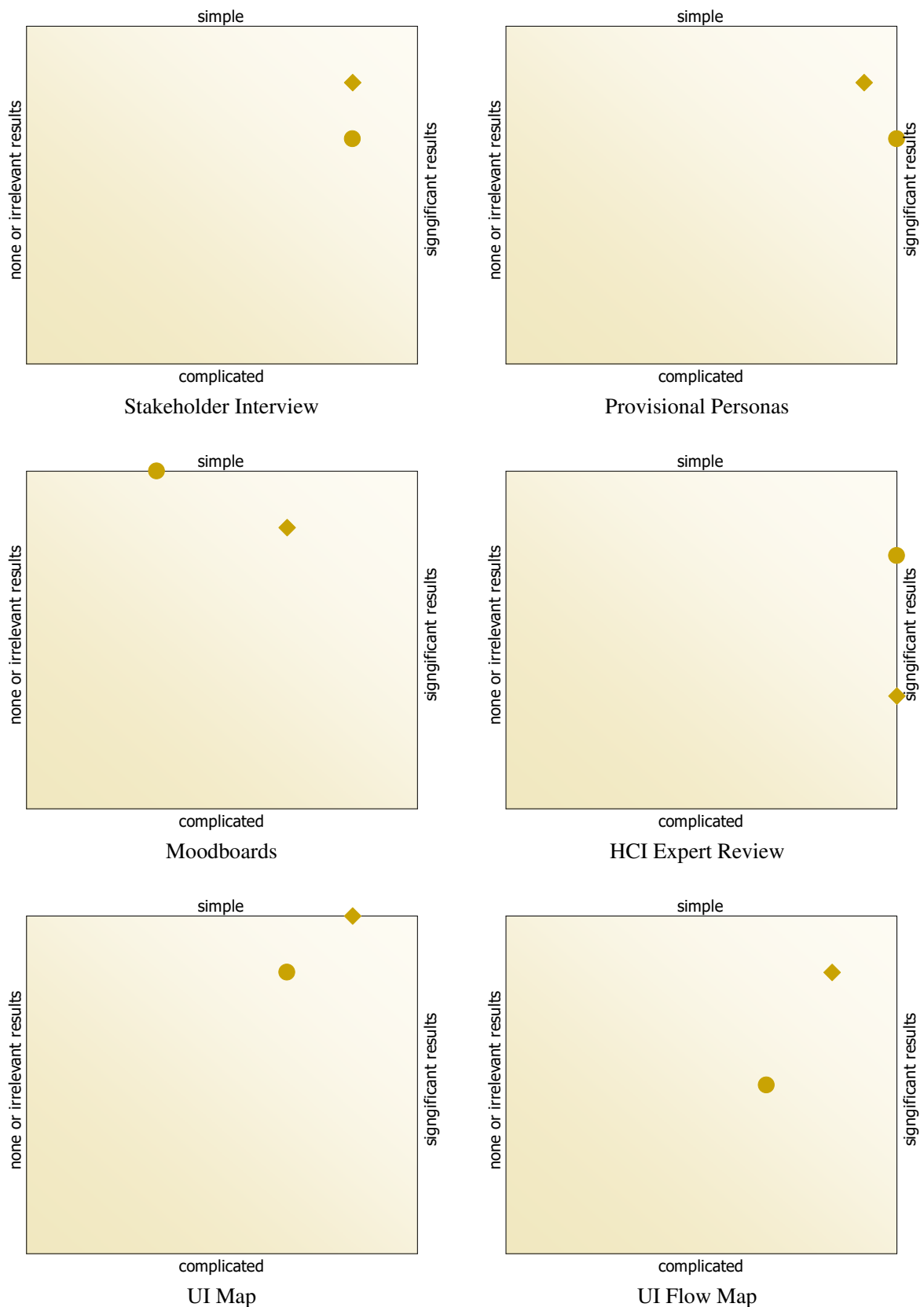
| Observation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Lesson                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Remote Contextual Inquiry – inviting participants was more successful when we omitted the expected time from the initial invitation. When asked later on, every participant was comfortable with the 30-60 minutes spent.                                                                                                                                                                                                                                                                                                                                                           | The content and articulation of the invitation email can have a big influence on how many people are willing to participate – in particular it seems the time required should not be mentioned in the very initial email ... |
| Remote Contextual Inquiry – conducting the RCI alone can be rather stressful. Due to scheduling conflicts, in contrast to our initial intention, the RCI were conducted by Bruno alone. We've been well prepared with Playbook and Template and we also had some experience with CIs from previous projects. Never the less, managing communication technology, interacting with the participant, observing participant activities all while staying on track with the playbook is a lot of multi-tasking for a single individual. Fortunately there is a WebEx recording function. | Whenever possible conduct Remote Contextual Inquiry as a team. WebEx recording can be a very useful tool to fill in gaps or even to review the entire RCI.                                                                   |
| Remote Contextual Inquiry – users can be disappointed if they cannot successfully complete the tasks, especiall while they are being observed                                                                                                                                                                                                                                                                                                                                                                                                                                       | When planning the CI, include a simple task and make sure the last part is a positive experience for the participant (in our case, the post-observation questions fulfilled this purpose reasonably well)                    |

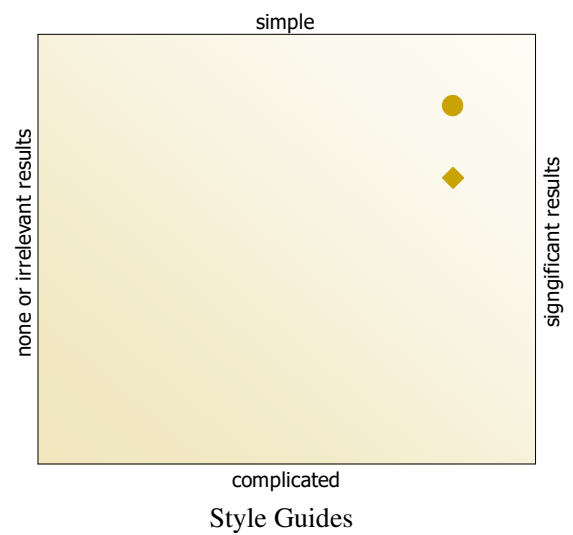
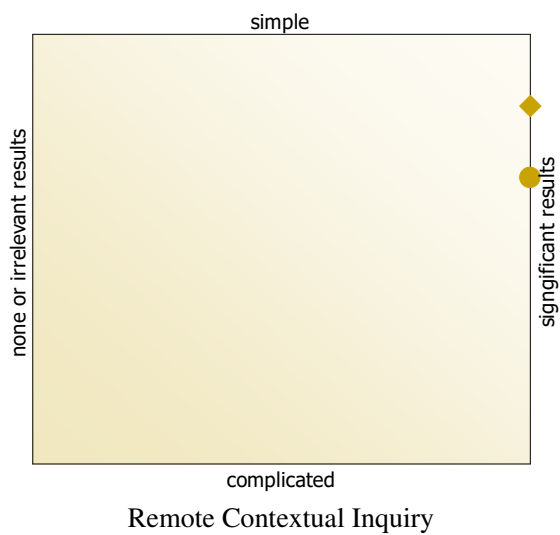
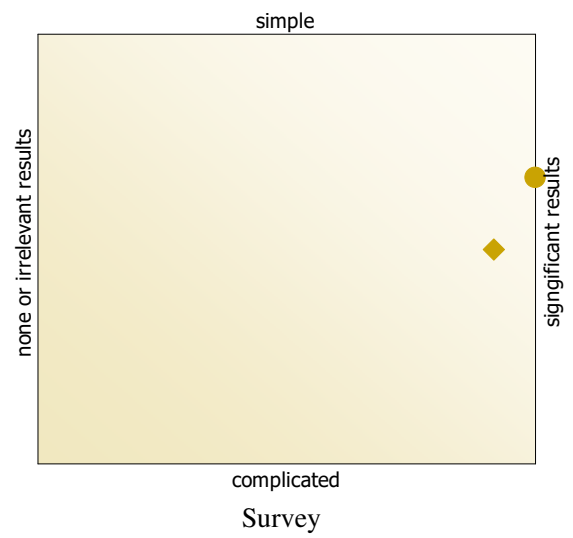
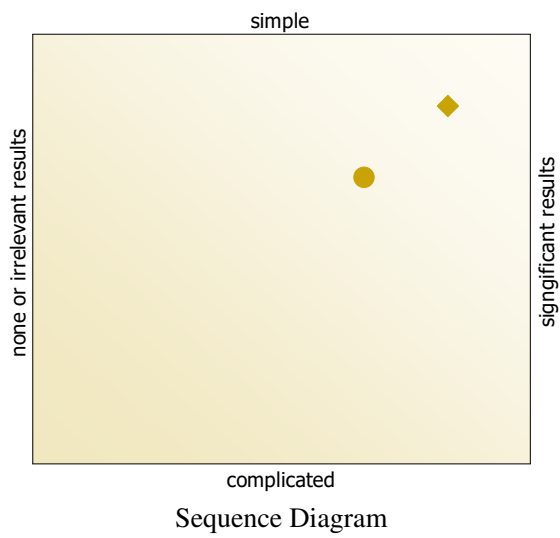
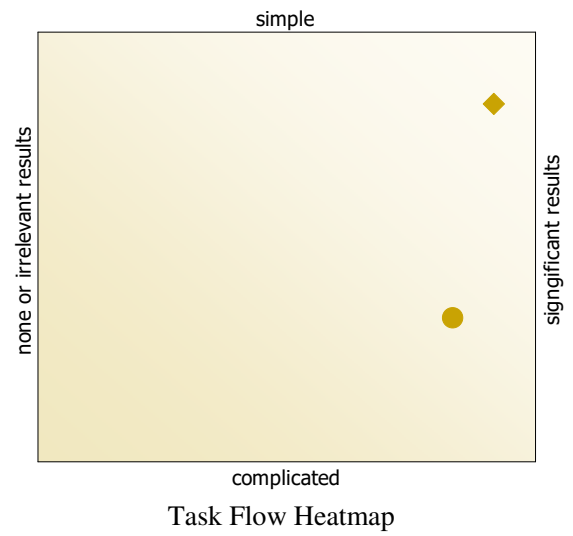
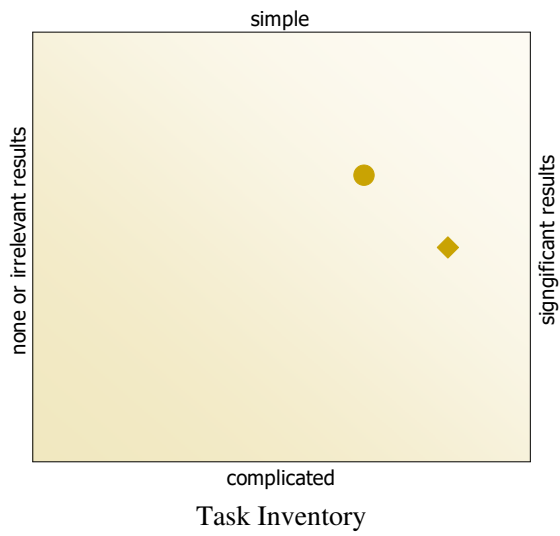
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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Card Sort – verbal feedback from Card Sorting participants suggests that some terms were placed or discarded based on an interpretation by the participants, which was different from the one intended by us.                                                                                                                             | Selection and phrasing of terms may influence the card sort results. An additional method/step should be planned to validate the terms before conducting the actual Card Sortings.                                                       |
| Team Work – once again we've experienced that a HCID project benefits greatly from inspiration, challenge and dialog.                                                                                                                                                                                                                     | Team Work is a key aspect of a HCI project. Most HCI methods must be conducted in an iterative and collaborative way to produce quality results.                                                                                         |
| Task List – the task list was updated by one project member and not sent periodically. The other project member was therefor not always up to date with the assigned tasks and completed tasks of the other project member were not tracked straight away.                                                                                | In projects with a similar organisation, the task list needs to be accessed from a central place to ensure both project members are always up to date regarding assignment of tasks and their completion.                                |
| Hallway Testing – the Hallway Testing has shown that not all questions are reasonable. Yes or no questions do not seem to be satisfying. If only a handful of people participate, quantitative statements are not enough supported and not enough meaningful.                                                                             | In a next Hallway Testing we would indeed create a list of questions but discuss the answers with the participant.                                                                                                                       |
| Prototyping – we have used Kubrick Visio Tool Kit and Balsamic for the first time. Both tools have been very helpful to create prototypes. Now being able to visualize recommendations in more professional tools than PowerPoint lets us look forward to future projects.                                                                | We will use Balsamic and Kubrick Visio Tool Kit in future projects and are looking forward to learning new Prototyping tools.                                                                                                            |
| UI Map – the UI Map was not at hand at all times. Gaining information from the screens of the application was essential in several situations.                                                                                                                                                                                            | The UI Map should be laminated just after creation to be at hand at all times.                                                                                                                                                           |
| Moodboards – the Moodboards were not as essential as we thought they would be in the beginning. We believe the time gap between the accomplishment of the methods Persona and Moodboard was too big.                                                                                                                                      | The Moodboards should be created during the discussion of the Personas. We imagine this would stimulate the discussion about the Personas. The Moodboards can even be the first artifact created when accomplishing the method Personas. |
| Stakeholder Interview – we were very happy to see that the answers to the questions in the Stakeholder Interview were very precise, even though the interview was not held face-to-face. This method works remote just as well. The questions need to be very precise.                                                                    | We will not shy at using this method in other projects with Stakeholders working abroad. For a next time we would consider having a skype chat before or after the Stakeholder Interview to meet the Stakeholder in person.              |
| Provisional Personas – this method is easily underestimated. The result seems very imprecise at first but the discussion about the principal components of human-machine interaction is really the essential part of this method. The discussion was very revealing and helped a lot during analysis, planning and concept establishment. | We will definitely use this method again in similar projects at an early stage.                                                                                                                                                          |

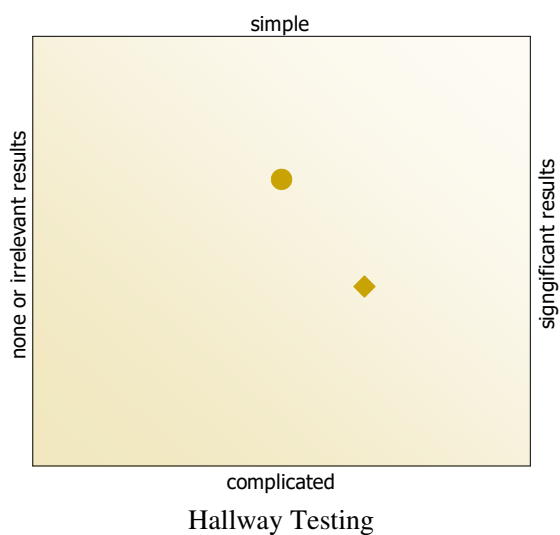
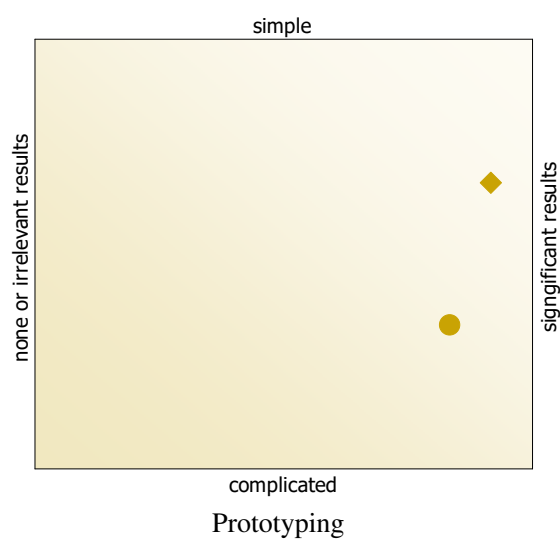
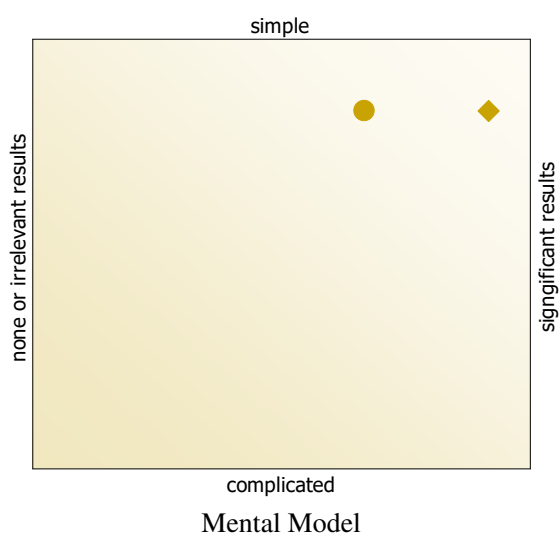
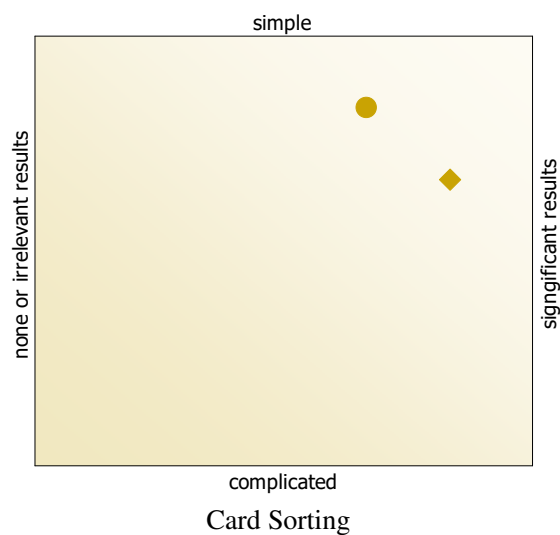
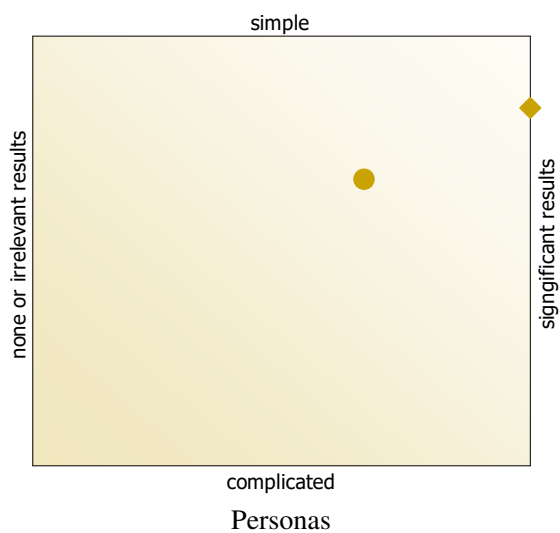
Table 17 – Observations and Lessons Learnt

## 7.2 Subjective Evaluation of Methods

The following quadrants indicate our evaluation of methods under a simplicity and complexity point of view. Nadja's evaluation is shown as a round symbol, Bruno's evaluation as a diamond.







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# Glossary

| Abbreviation | Term                             | Definition                                                                                                                                                                                                                                                                                                                                                                                                                           |
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|              | Affordance                       | In the context of this project: Action possibilities of which a user is intuitively aware.<br>See also <a href="http://en.wikipedia.org/wiki/Affordance">http://en.wikipedia.org/wiki/Affordance</a>                                                                                                                                                                                                                                 |
|              | Breadcrumb                       | Breadcrumb navigation or breadcrumb trails helps the user keep track of current position within an application. Example:<br>HomePage > SectionPage > SubSectionPage<br>See also <a href="http://en.wikipedia.org/wiki/Breadcrumb_(navigation)">http://en.wikipedia.org/wiki/Breadcrumb_(navigation)</a>                                                                                                                              |
|              | Context                          | Context indicates the working area, tools used and the ambience.                                                                                                                                                                                                                                                                                                                                                                     |
| CRM          | Customer Relationship Management | Customer relationship management (CRM) is a broadly recognized, widely implemented strategy for managing and nurturing a company's interactions with customers and sales prospects.<br>See also<br><a href="http://en.wikipedia.org/wiki/Customer_relationship_management">http://en.wikipedia.org/wiki/Customer_relationship_management</a>                                                                                         |
| CWI          | Completed Work Item              | Results from method application is analyzed and described in chapter Completed Work.                                                                                                                                                                                                                                                                                                                                                 |
| FAQs         | Frequently Asked Questions       |                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| GUI          | Graphical User Interface         | A GUI offers graphical icons, and visual indicators, as opposed to text-based interfaces, typed command labels or text navigation to fully represent the information and actions available to a user. The actions are usually performed through direct manipulation of the graphical elements.<br>See also <a href="http://en.wikipedia.org/wiki/Graphical_user_interface">http://en.wikipedia.org/wiki/Graphical_user_interface</a> |
| H1/H2/H3/H4  | Hypothesis 1/2/3/4               | Four main hypotheses (H1 – H4) describe the wider area of interest around the Smart Call Home project.                                                                                                                                                                                                                                                                                                                               |
| HCI          | Human Computer Interaction       | A diverse scientific and applied field where the focus is on how people use computers and how computers can be designed to help people use them more effectively.<br>( <a href="http://www.usabilityfirst.com/glossary/main.cgi?function=display_term&amp;term_id=40">http://www.usabilityfirst.com/glossary/main.cgi?function=display_term&amp;term_id=40</a> )                                                                     |
| Hi-Fi        | High-Fidelity                    | A prototype that is quite close to the final product, with lots of detail and functionality.<br><a href="http://www.usabilityfirst.com/glossary/main.cgi?function=display_term&amp;term_id=377">http://www.usabilityfirst.com/glossary/main.cgi?function=display_term&amp;term_id=377</a>                                                                                                                                            |
| I18N         | Internationalization             | In the context of this project: Different languages and regional differences are considered in design standards. Internationalization is the process of designing a software application so that it can be adapted to various languages and regions without engineering changes.<br>See also                                                                                                                                         |

|        |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        |                          | <a href="http://en.wikipedia.org/wiki/Internationalization_and_localization">http://en.wikipedia.org/wiki/Internationalization_and_localization</a>                                                                                                                                                                                                                                                                                     |
| ID     | Interaction Design       | Interaction design defines the behavior (the "interaction") of an artifact or system in response to its users.<br>See also <a href="http://en.wikipedia.org/wiki/Interaction_design">http://en.wikipedia.org/wiki/Interaction_design</a>                                                                                                                                                                                                |
| L10N   | Localization             | In the context of this project: Different languages and regional differences are considered in design standards. Localization is the process of adapting internationalized software for a specific region or language by adding locale-specific components and translating text.<br><a href="http://en.wikipedia.org/wiki/Internationalization_and_localization">http://en.wikipedia.org/wiki/Internationalization_and_localization</a> |
| Low-Fi | Low-Fidelity             | A prototype that is sketchy and incomplete, that has some characteristics of the target product but is otherwise simple, usually in order to quickly produce the prototype and test broad concepts.<br>( <a href="http://www.usabilityfirst.com/glossary/term_378.tx1">http://www.usabilityfirst.com/glossary/term_378.tx1</a> )                                                                                                        |
| RE     | Requirements Engineering | RE is part of the software- and development process with the aim to determine and identify requirements towards the development of a product or system.                                                                                                                                                                                                                                                                                 |
| RUP    | Rational Unified Process | The Rational Unified Process (RUP) is an iterative software development process framework created by the Rational Software Corporation, a division of IBM since 2003.<br>See also <a href="http://en.wikipedia.org/wiki/IBM_Rational_Unified_Process">http://en.wikipedia.org/wiki/IBM_Rational_Unified_Process</a>                                                                                                                     |
| SAN    | Storage Area Network     | A storage area network (SAN) is an architecture to attach remote computer storage devices (such as disk arrays, tape libraries, and optical jukeboxes) to servers in such a way that the devices appear as locally attached to the operating system.<br>See also <a href="http://en.wikipedia.org/wiki/Storage_area_network">http://en.wikipedia.org/wiki/Storage_area_network</a>                                                      |
| SME    | Subject Matter Expert    | An SME is an expert in a particular area.                                                                                                                                                                                                                                                                                                                                                                                               |
| SNMP   | Simple Network Protocol  | Is a widely used protocol for monitoring the health and welfare of network equipment (eg. routers).<br>See also <a href="http://www.net-snmp.org">http://www.net-snmp.org</a>                                                                                                                                                                                                                                                           |
|        | Stakeholder              | A Stakeholder is anyone with authority and/or responsibility for the product being designed. More specifically, Stakeholders are key members of the organization commissioning the design work, and typically include executives, managers, and representative contributors from development, sales, product management, marketing, customer support, design and usability <sup>[CC07]</sup> .                                          |
| TTS    | Trouble Ticketing System | A Trouble Ticketing System is an information system used to capture and prioritize incidents or issues and track their resolution. Often this is used when two or multiple organizations are involved, such as for example network operations departments, end customers and hardware vendors.                                                                                                                                          |

Table 18 – Glossary

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# Appendix I – Objective

## Appendix I.a – Signed Project Proposal



**HSR**  
HOCHSCHULE FÜR TECHNIK  
RAPPERSWIL  
  
WEITERBILDUNG

Seite 1 von 5

## MAS HCID - Masterarbeit

### Projektantrag

- 1. Thema der Arbeit**  
 SmartCallHome - Smart use of online status information by users and user groups.
- 2. Allgemeine Angaben**  

|                |                                                   |
|----------------|---------------------------------------------------|
| Auftraggeber:  | Tim Johnson, Product Manager Smartcallhome, Cisco |
| Kontaktperson: | Tim Johnson, Cisco                                |
| Autor:         | Nadja Weisskopf, Bruno Klauser                    |
| Datum:         | 2009-06-02                                        |
| Betreuer:      | Marcel Uhr                                        |
- 3. Kurzbeschreibung**
  1. Background and Context  

Cisco develops and provides equipment (such as routers, switches, etc) used to build and operate networks. Since recently, this equipment can periodically send status and configuration details via internet to cisco.com. Today, the resulting evaluations can be accessed by the equipment operators in tabular form via HTML/browser.

In the future, the information shall be presented and used in a variety of ways and potentially be accessible via other ways than HTML/browser. (see [www.cisco.com/go/smartcall](http://www.cisco.com/go/smartcall) )
  2. Objectives and Benefits of the Project  

The project shall - based on analysis of motivation, context and profile of users - document known (suspected) scenarios from the user's point of view and identify possible new scenarios. New scenarios based on the use of current web technologies (such as (wikis, rss, communities, netbooks, smart phones, mobile tags, etc ...)) shall be illustrated. Proposals regarding interaction design for new (or up-dated) scenarios shall be detailed.

Findings and results may be considered for future releases of Smartcallhome.
  3. Motivation  

Industry Partner: fresh, independent view on users, scenarios and interaction design possibilities.

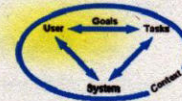
Students: ideal combination of real project/interest and enough freedom / independence to experiment with recently learnt methods.

## 4. Konkretisierung der Ziele der Arbeit

### 1. Goals

Four main hypotheses (H1 – H4) describe the wider area of interest around the Smartcallhome project.

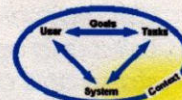
- **H1:** Users can be Customer-, Partner- or Cisco Staff in a range of different job roles and responsibilities. The skills, experience and motivation of these users may vary.



→ **Hypothesis:** The current interaction structure and concept accurately reflect the needs and wants of all personas.

→ **Antithesis:** The current interaction structure and concept do not reflect the needs and wants of all personas.

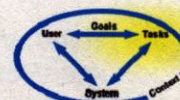
- **H2:** Some features are used in normal office contexts while other features may be used in labs, on site, under stress, multi-tasking and with poor ambient conditions (light, noise, etc).



→ **Hypothesis:** The current interaction structure and concept accurately support system use within the relevant contexts.

→ **Antithesis:** The current interaction structure and concept do not accurately support system use within the relevant contexts.

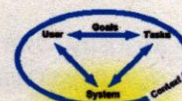
- **H3:** The current (End of May 2009) version of the Smart-callhome web application provides a given set of features. There may be additional steps, which could and should be supported.



→ **Hypothesis:** The current interaction structure and concept accurately support all relevant goals and tasks.

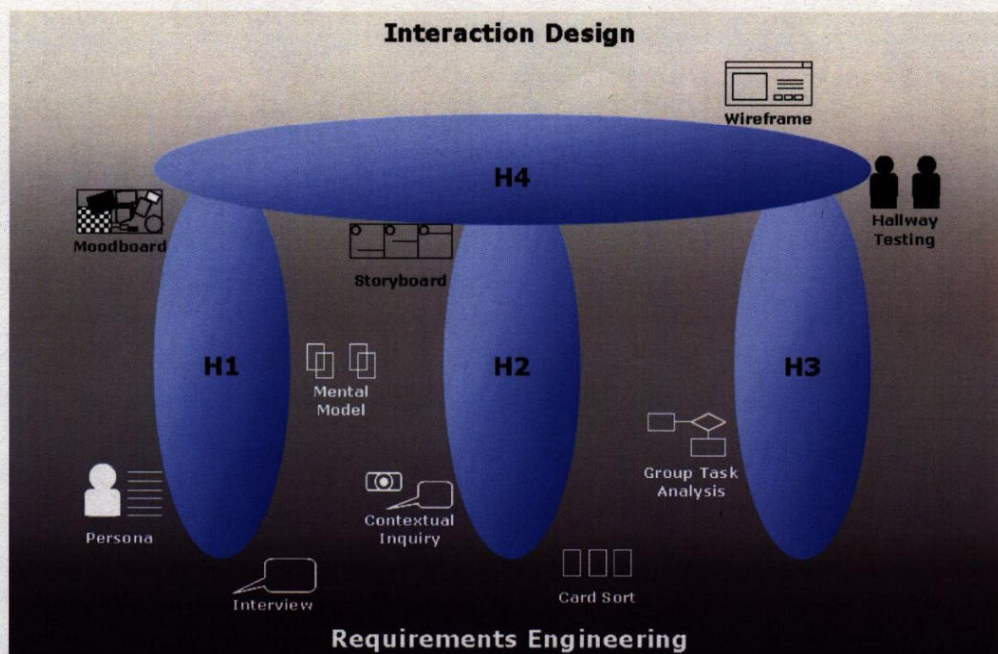
→ **Antithesis:** The current interaction structure and concept do not accurately support all relevant goals and tasks.

- **H4:** The current (End of May 2009) version of the Smart-callhome web application is built on a given architecture and set of technologies. There may be additional, more appropriate interaction structures and concepts which may require different architecture and/or technologies. (email, rss, sms/text, pager, wiki, beacon, redirect, ...)



→ **Hypothesis:** The architecture and set of technologies accurately represent all relevant interaction structures and concepts.

→ **Antithesis:** The architecture and set of technologies do not represent all relevant interaction structures and concepts.

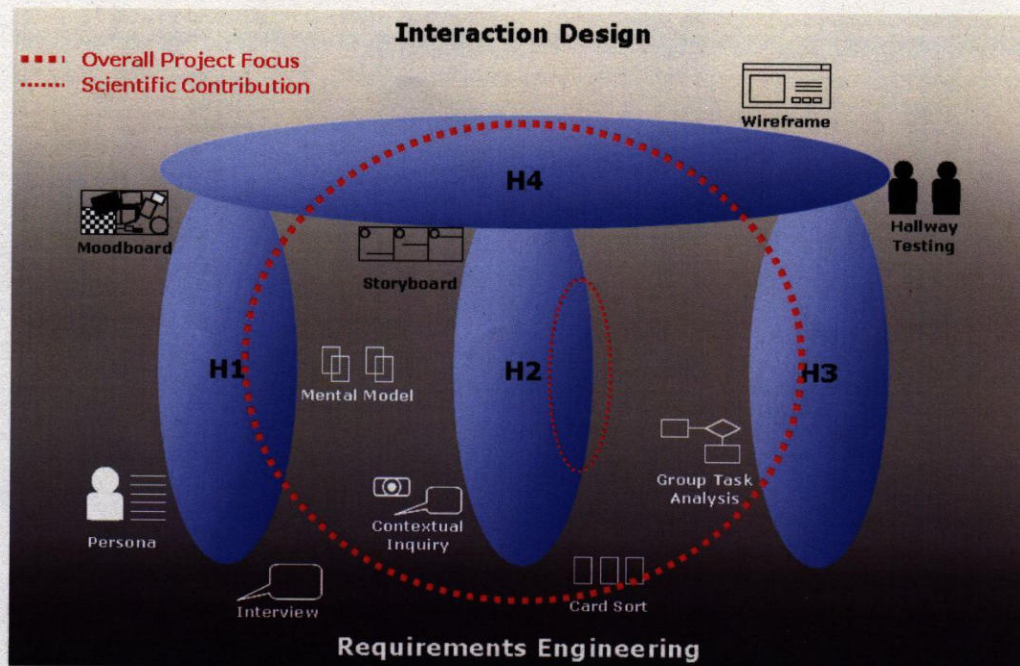


Within this wider area of interest, a scope and focus for the study project are defined hereafter to satisfy the individual goals regarding:

- **Project deliverables:** (in-)validate one of the hypothesis H1-H4, document related Requirements Engineering and derive applicable Interaction Design and overall recommendations.  
Findings related to the other 3 hypothesis – which may emerge as a by-product – shall be documented as well.
- **Scientific contribution:** within the main hypothesis chosen as project deliverable, one or more specific aspects shall be scientifically analyzed and discussed.  
Candidate: the influence of stress and multi-tasking on user interaction, or similar.
- **Methods applied:** the methods chosen shall support project deliverables and/or scientific contribution or may be chosen to experiment with newly learnt methods.  
Candidates: Interview, Contextual Inquiry, Personas, Moodboard, Card Sorting, Mental Model, Group Task Analysis, Needs Analysis, Storyboard, Wireframe, Hallway Testing, Experimental Verification, ...
- **Student's objectives:** ability to experiment with recently learnt methods in the context of a real project. Combine well-known HCID methods and scientific contribution to produce relevant deliverables.

## 2. Focus and Scope

Main Focus of the project is H2.



At the beginning of the project, the following aspects are explicitly known as in-scope or out-of-scope:

- In Scope:
  - RE and ID phases up to early prototyping phases
  - Primary and (subset of) secondary Personas
  - Project Report and Presentations
- Out of Scope:
  - Software development and transition into production
  - Culture and I18N and L10N related issues beyond swiss diversity
  - Generalization beyond the characteristics of this project

## **5. Randbedingungen, Besonderheiten**

The project (Report, Presentation) has to be documented in English.  
Existing style guides (Kubrick) shall be used as far as available and applicable.

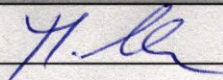
## 6. Geheimhaltung, Rechte

Can the Project be disclosed to interested 3rd parties?

→ Presentation YES, Report subject to approval for disclosure upon completion

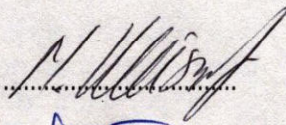
Can the Project be used/quoted within lectures?

→ Presentation YES, Report subject to approval for disclosure upon completion

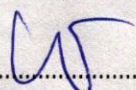
| Datum      | Freigabe durch Betreuer | Unterschrift                                                                        |
|------------|-------------------------|-------------------------------------------------------------------------------------|
| 2009-06-16 | Marcel Uhr              |  |

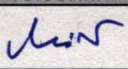
Unterschriften der Projektmitglieder

Name: ...Nadja Weisskopf.....

Unterschrift: 

Name: ...Bruno Klauser.....

Unterschrift: 

| Datum   | Freigabe durch Studienleitung | Unterschrift                                                                         |
|---------|-------------------------------|--------------------------------------------------------------------------------------|
| 18.1.09 | Prof. Dr. Lothar Müller       |  |

# Appendix II – Background

## Appendix II.a – Smart Call Home Architecture

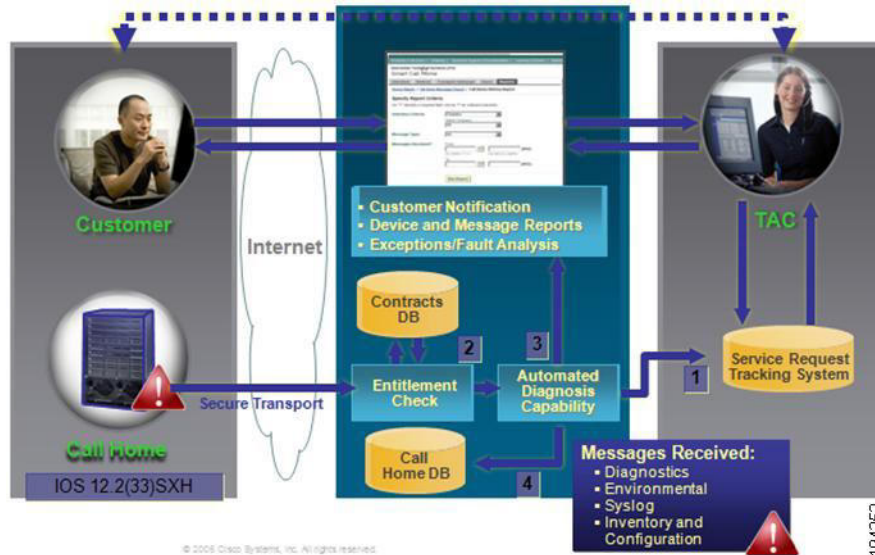


Figure 41 – Smart Call Home Architecture – Overview 1

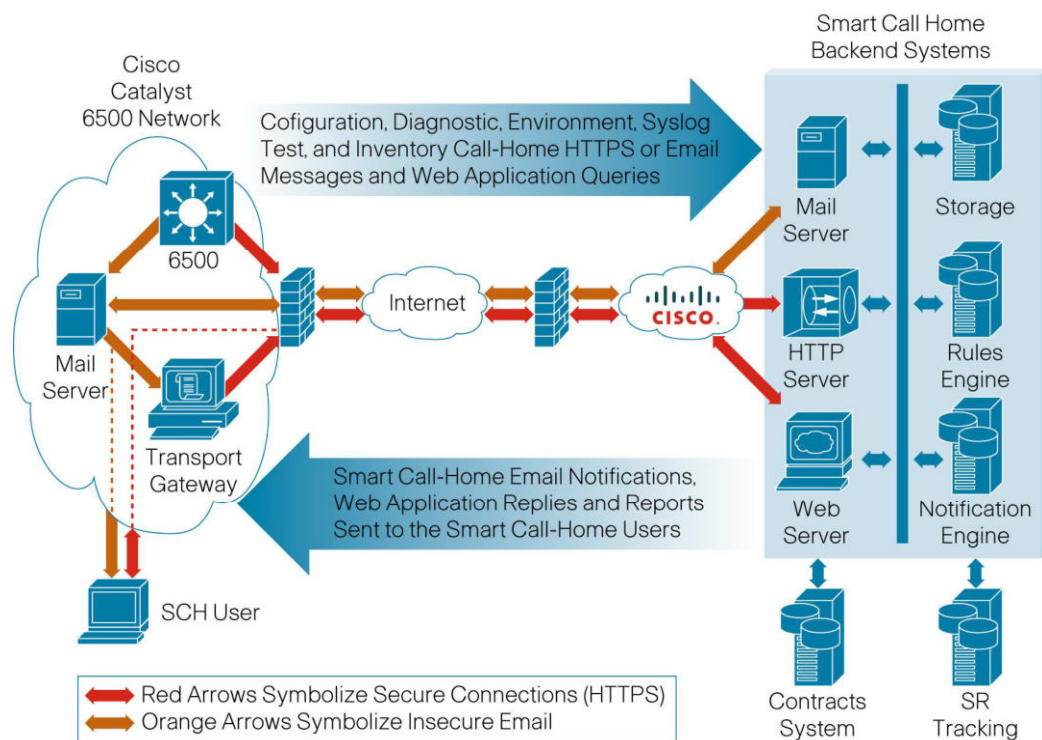


Figure 42 – Smart Call Home Architecture – Overview 2

Source: Cisco

# Appendix III – Methodology

## Appendix III.a – Project Risks

| Risk ID | Description                                                                                                      | Impact                | Probability | Weight               | Mitigation                                                | Remedy                                          |
|---------|------------------------------------------------------------------------------------------------------------------|-----------------------|-------------|----------------------|-----------------------------------------------------------|-------------------------------------------------|
|         |                                                                                                                  | % of Project impacted | [0 ... 1]   | Impact x Probability | How to prevent ....                                       | What if it happens ...                          |
| R001    | Ongoing Project Management not properly done                                                                     | 100                   | 0           | 0.00                 | Reviews upon each Meeting                                 | n/a                                             |
| R002    | Risk Management not properly done                                                                                | 100                   | 0           | 0.00                 | Reviews upon each Meeting                                 | n/a                                             |
| R003    | Availability of Project members                                                                                  | 100                   | 0.05        | 0.05                 | Planning / Time tracking tool                             | n/a                                             |
| R004    | Availability of Project coach                                                                                    | 50                    | 0           | 0.00                 | Planning / Early engagement                               | n/a                                             |
| R005    | Lack of scientific approach                                                                                      | 50                    | 0           | 0.00                 | Reviews, Research                                         | n/a                                             |
| R006    | Lack of information to elaborate hypothesis                                                                      | 75                    | 0           | 0.00                 | Inception, Risk Management                                | n/a                                             |
| R007    | Realistic Scope & Vision not set and/or lack of common understanding thereof                                     | 75                    | 0           | 0.00                 | Vision Document, i.l, reduce scope (number of interfaces) |                                                 |
| R008    | Selection of Methods and/or Tools not appropriate                                                                | 40                    | 0           | 0.00                 | Reviews                                                   | n/a                                             |
| R009    | RE Focus not supporting hypothesis and/or ID focus                                                               | 50                    | 0           | 0.00                 | Reviews                                                   |                                                 |
| R010    | Availability 3rd Party Contributors                                                                              | 75                    | 0           | 0                    | Early Engagements                                         | more Partners                                   |
| R011    | Documentation not ready                                                                                          | 100                   | 0.05        | 0.05                 | more focus on documentation                               | n/a                                             |
| R012    | Limited availability of required quantitative information (ie.: access statistics, user distributions, etc. ...) | 25                    | 0           | 0                    | Assumptions, Scope validity of findings                   | n/a                                             |
| R013    | Limited ability to produce required quantitative RE/ID (languages, countries, ID testing, etc. ....)             | 10                    | 0           | 0                    | Assumptions, Scope validity of findings                   | n/a                                             |
| R014    | Missing linkage between scientific and practical approaches                                                      | 50                    | 0           | 0                    | Early Research and Verification                           | Revised Approach and/or meta-level consequences |

Table 19 – Project Risks – from Risk Management Spreadsheet

Column ‘Probability’ was periodically assessed throughout the project – snapshot taken on Dec 5<sup>th</sup> 2009.

## Appendix III.b – Team Responsibilities

| Task and Documentation                          | Responsibility |
|-------------------------------------------------|----------------|
| Objective                                       | both           |
| Background – Concept of Smart Call Home         | Bruno          |
| Background – Effects of Stress on User Behavior | Nadja          |
| Methodology – Iteration Planning                | Nadja          |
| Methodology – Risk Management                   | both           |
| Methodology – Stakeholders                      | both           |
| Methodology – Stakeholder Interview             | both           |
| Methodology – Provisional Personas              | both           |
| Methodology – Moodboards                        | both           |
| Methodology – HCI Expert Review                 | Nadja          |
| Methodology – User Interface Map                | Bruno          |
| Methodology – User Interface Flow Map           | Bruno          |
| Methodology – Task Inventory                    | both           |
| Methodology – Task Flow Heat Map                | Bruno          |
| Methodology – Sequence Diagrams                 | Both           |
| Methodology – Survey                            | Both           |
| Methodology – Remote Contextual Inquiry         | Bruno          |
| Methodology – Existing Style Guides             | Bruno          |

|                                                       |      |
|-------------------------------------------------------|------|
| Methodology – Personas                                | Both |
| Methodology – Card Sorting                            | both |
| Methodology – Mental Model                            | both |
| Methodology – Prototyping                             | both |
| Methodology – Hallway Testing                         | both |
| Evaluation of methods used                            | both |
| Analysis of the executed methods                      | both |
| Completed Work – Project Internal                     | both |
| Completed Work – Dealing with Stress                  | both |
| Completed Work - Deliverables                         | both |
| Results and Discussion – Discussion of Thesis H2      | both |
| Results and Discussion – Relevance and Interpretation | both |
| Results and Discussion – Findings and Recommendations | both |
| Future Work                                           | both |
| Lessons Learnt                                        | both |
| Glossary and Literature                               | both |
| Graphics                                              | both |
| Documentation                                         | both |

Table 20 – Team Responsibilities

## Appendix III.c – Project Reporting

Time and activity reporting for the project was implemented using a free online service called mite (<http://mite.yo.lk/>). This tool has been very helpful in earlier projects and is therefore used in this project too. Mite provides detail and summary reports per person, per activity or for the project overall, which is useful to track progress against the original planning.

### Smart Call Home für Cisco

Status: aktiv

Projektdauer

**289 Tage 7. April 2009 bis 20. Januar 2010**

Effektive Arbeitstage / Arbeitswochen

**91 Tage / 38 Wochen**

Budget

**600:00 Stunden**

Budgetauslastung

**94% – 38:00 Stunden verbleibend**

Arbeitszeit

**562,0 Stunden**

Durchschnittlich pro Arbeitstag / Arbeitswoche

**6,17 Stunden / 14,78 Stunden**

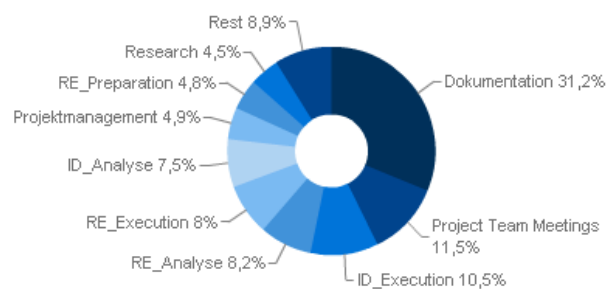


Figure 43 – Project Reporting based on mite as of Jan 20 2010

## Appendix III.d – Survey



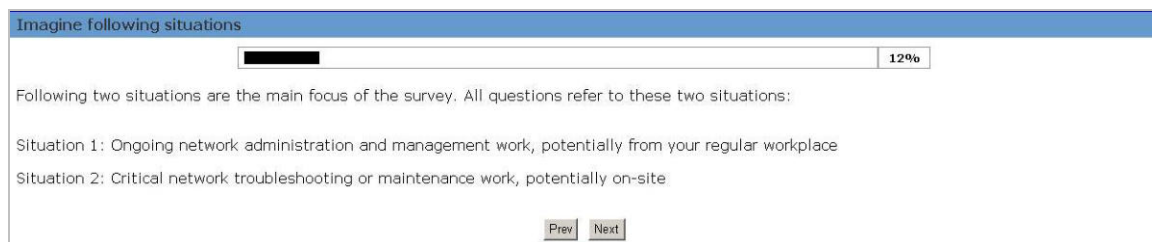
**Usability Project HCID**  
Introduction

6%

Thank you for your contribution to our Usability Study Project HCID.  
The survey will not take longer than 10 minutes.  
Your participation will be handled confidentially.

Next

Figure 44 – Survey Start Page



Imagine following situations

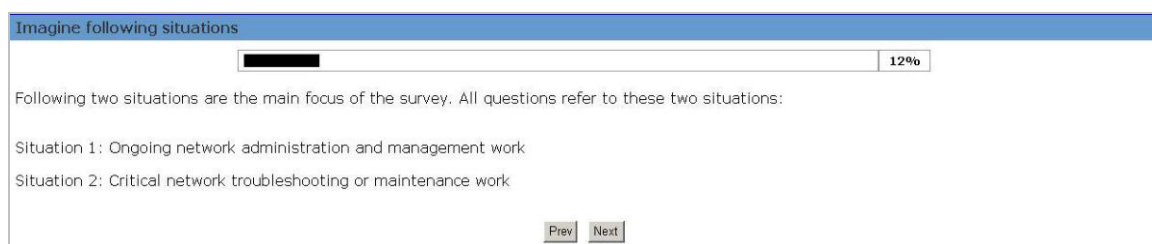
12%

Following two situations are the main focus of the survey. All questions refer to these two situations:

Situation 1: Ongoing network administration and management work, potentially from your regular workplace  
Situation 2: Critical network troubleshooting or maintenance work, potentially on-site

Prev Next

Figure 45 – Survey Intro Iteration 1



Imagine following situations

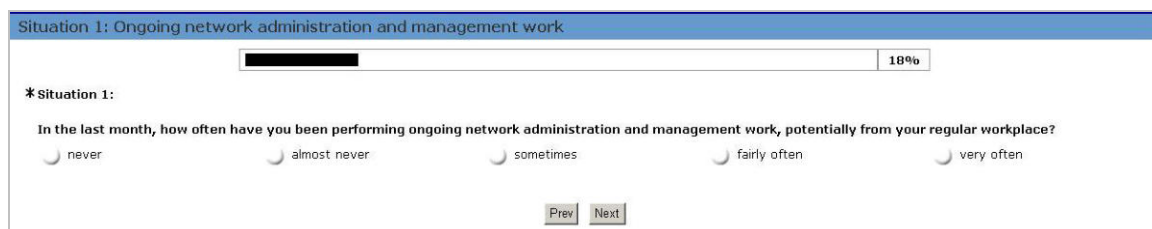
12%

Following two situations are the main focus of the survey. All questions refer to these two situations:

Situation 1: Ongoing network administration and management work  
Situation 2: Critical network troubleshooting or maintenance work

Prev Next

Figure 46 – Survey Intro Iteration 2



Situation 1: Ongoing network administration and management work

18%

\* Situation 1:

In the last month, how often have you been performing ongoing network administration and management work, potentially from your regular workplace?

☐ never ☐ almost never ☐ sometimes ☐ fairly often ☐ very often

Prev Next

Figure 47 – Survey Situation 1

**Situation 1 - Apperception**

24%

Imagine situation 1: Ongoing network administration and management work, potentially from your regular work place

**\* In the last month, how often have you felt that you were unable to control the important things in your job?**

☐ never ☐ almost never ☐ sometimes ☐ fairly often ☐ very often

**\* In the last month, how often have you felt that you were on top of things?**

☐ never ☐ almost never ☐ sometimes ☐ fairly often ☐ very often

**\* In the last month, how often have you felt nervous and "stressed"?**

☐ never ☐ almost never ☐ sometimes ☐ fairly often ☐ very often

**\* In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?**

☐ never ☐ almost never ☐ sometimes ☐ fairly often ☐ very often

**\* In the last month, how often have you felt that things were going your way?**

☐ never ☐ almost never ☐ sometimes ☐ fairly often ☐ very often

Figure 48 – Survey Situation 1 PSS Questions

**Situation 1 - Context**

29%

Imagine situation 1: Ongoing network administration and management work, potentially from your regular work place

**In the last month, how have you been engaged in such a situation?**

☐ by human request

☐ by an automated alert

☐ periodic activity

☐ scheduled project

☐ idle activity

**Other engagements not mentioned above**

Figure 49– Survey Situation 1 Context

**Situation 1 - Tools**

35%

Imagine situation 1: Ongoing network administration and management work, potentially from your regular work place

**In the last month, which of the following tools have you used in such a situation?**

☐ Pager

☐ Mobile Phone

☐ Smartphone / Blackberry

☐ Notebook

☐ Desk Phone

☐ Desktop PC

☐ Barcode Scanner

☐ Rack Console

☐ Paper and Pen

☐ Checklist

☐ RSS

☐ SMS

☐ newsgroups / forums

☐ Trouble Ticketing System

☐ Network Management System

☐ CRM System

☐ Intranet

☐ Telnet / SSH Client

**Other Tools not mentioned above**

Figure 50 – Survey Situation 1 Tools

**Situation 1 - Collaboration**

Imagine situation 1: Ongoing network administration and management work, potentially from your regular work place

**In the last month, with whom have you been collaborating in such a situation?**

- ☐ Peers
- ☐ Senior Colleagues
- ☐ Management
- ☐ Process Escalation Contact
- ☐ Technical Escalation Contact
- ☐ Local or 1st Level Contacts
- ☐ End User
- ☐ Partner Support Contact
- ☐ Vendor Support Contact

**Other collaboration not mentioned above**

Prev Next

Figure 51 – Survey Situation 1 Collaboration

**Situation 1 - Extractions and Irritations**

Imagine situation 1: Ongoing network administration and management work, potentially from your regular work place

**In the last month, which of the following have you experienced as disturbing in such a situation?**

- ☐ increased background noise
- ☐ insufficient ambient light
- ☐ poor working conditions
- ☐ multi-tasking, several requests in parallel
- ☐ conflicting priorities
- ☐ interruptions via face-to-face contact
- ☐ interruptions via phone or emails
- ☐ too much irrelevant data
- ☐ not enough detail
- ☐ inconsistent levels of information
- ☐ no access to key information
- ☐ contradicting information
- ☐ information spread across many different places

**Other disturbing experiences not mentioned above**

Prev Next

Figure 52– Survey Situation 1 Distractions

**Situation 2: Critical network troubleshooting or maintenance work**

Imagine situation 2: Critical network troubleshooting or maintenance work, potentially on-site

**\*Situation 2:**

**In the last month, how often have you been performing critical network troubleshooting or maintenance work, potentially on-site?**

☐ never ☐ almost never ☐ sometimes ☐ fairly often ☐ very often

Prev Next

Figure 53 – Survey Situation 2

**Situation 2 - Apperception**

59%

Imagine situation 2: Critical network troubleshooting or maintenance work, potentially on-site

\* In the last month, how often have you felt that you were unable to control the important things in your job?

☐ never ☐ almost never ☐ sometimes ☐ fairly often ☐ very often

\* In the last month, how often have you felt that you were on top of things?

☐ never ☐ almost never ☐ sometimes ☐ fairly often ☐ very often

\* In the last month, how often have you felt nervous and "stressed"?

☐ never ☐ almost never ☐ sometimes ☐ fairly often ☐ very often

\* In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

☐ never ☐ almost never ☐ sometimes ☐ fairly often ☐ very often

\* In the last month, how often have you felt that things were going your way?

☐ never ☐ almost never ☐ sometimes ☐ fairly often ☐ very often

[Prev](#) [Next](#)

Figure 54 – Survey Situation 2 PSS Questions

**Situation 2 - Context**

65%

Imagine situation 2: Critical network troubleshooting or maintenance work, potentially on-site

In the last month, how have you been engaged in such a situation?

☐ by human request

☐ by an automated alert

☐ periodic activity

☐ scheduled project

☐ idle activity

Other engagements not mentioned above

[Prev](#) [Next](#)

Figure 55 – Survey Situation 2 Context

**Situation 2 - Tools**

71%

Imagine situation 2: Critical network troubleshooting or maintenance work, potentially on-site

In the last month, which of the following tools have you used in such a situation?

☐ Pager

☐ Mobile Phone

☐ Smartphone / Blackberry

☐ Notebook

☐ Desk Phone

☐ Desktop PC

☐ Barcode Scanner

☐ Rack Console

☐ Paper and Pen

☐ Checklist

☐ Workflow Description

☐ email

☐ RSS

☐ SMS

☐ newsgroups / forums

☐ Trouble Ticketing System

☐ Network Management System

☐ CRM System

☐ Intranet

☐ Telnet / SSH Client

Other Tools not mentioned above

[Prev](#) [Next](#)

Figure 56 – Survey Situation 2 Tools

**Situation 2 - Collaboration**

76%

Imagine situation 2: Critical network troubleshooting or maintenance work, potentially on-site

**In the last month, with whom have you been collaborating in such a situation?**

- ☐ Peers
- ☐ Senior Colleagues
- ☐ Management
- ☐ Process Escalation Contact
- ☐ Technical Escalation Contact
- ☐ Local or 1st Level Contacts
- ☐ End User
- ☐ Partner Support Contact
- ☐ Vendor Support Contact

**Other collaboration not mentioned above**

Prev Next

Figure 57 – Survey Situation 2 Collaboration

**Situation 2 - Extractions and Irritations**

82%

Imagine situation 2: Critical network troubleshooting or maintenance work, potentially on-site

**In the last month, which of the following have you experienced as disturbing in such a situation?**

- ☐ increased background noise
- ☐ insufficient ambient light
- ☐ poor working conditions
- ☐ multi-tasking, several requests in parallel
- ☐ conflicting priorities
- ☐ interruptions via face-to-face contact
- ☐ interruptions via phone or emails
- ☐ too much irrelevant data
- ☐ not enough detail
- ☐ inconsistent levels of information
- ☐ no access to key information
- ☐ contradicting information
- ☐ information spread across many different places

**Other disturbing experiences not mentioned above**

Prev Next

Figure 58 – Survey Situation 2 Distractions

**Comments**

88%

Thank you very much for your participation.

**Any other comment you wish to make?**

**\* Would you be interested and available to answer further questions we might have?**

☐ yes

☐ no

Prev Next

Figure 59 – Survey Comments

Figure 60 – Survey Contact Details

Figure 61 – Survey Thank You Note

Figure 62 – Post Survey Redirection to www.cisco.com/go/smartcall

## Appendix III.e – Remote Contextual Inquiry Playbook

### Preparation and Invitation

1. Selection of suitable, active users
2. Notice to Smart Call Home Product Management (negative approval)
3. Invitation email to users
4. Confirmation email to users with positive reply including:
  - a. Date/Time
  - b. WebEx details
  - c. Request to plug in a webcam if available
  - d. Request to take the meeting from the actual workplace (not a meeting room)
  - e. Request to have Smart Call Home credentials at hand
  - f. Notice regarding anonymized use only of results
5. Prepare empty report, task instructions for copy&paste and notes

### Welcome and Introduction

1. Introduce project members
2. Outline project
  - a. Research and study project of MAS HCID
  - b. Spell out HCID
  - c. Focus on context of use of the Smart Call Home web application
  - d. Goal: understand actual/potential user requirements
  - e. In order to compile findings and recommendations future releases
3. Outline session objective
  - a. get an impression of your work environment
  - b. understand how you approach a typical task
  - c. give you an opportunity to share feedback, suggestions, observations
4. Format
  - a. Remote Contextual Inquiry – a combination of interview and observation
  - b. Anonymous and confidential
  - c. There is no right or wrong
  - d. You can stop at any point in time
  - e. May we record: Yes/No
  - f. Are you ok to share webcam and desktop: Yes/No

### Pre-Observation Questions

### Ready to Go ?

1. Clarify any open questions
2. Make presenter in WebEx
3. Ask to close/minimize any confidential windows and share desktop
4. If needed, ask to re-adjust webcam

#### Important to keep in mind:

- recording and cam
- stay focused
  - tools
  - interfaces
  - actions / process
- role play: master-apprentice
- notes on CI template
- keep track of time

## Start Observation Part

## End Observation Part

1. Thank you – very well done  
remember there is no right or wrong
2. How do you feel?

## Workplace and Context

1. If possible, ask for a camera sweep
2. Clarify any tools, artifacts, distractions observed

## Post-Observation Questions

## Wrap-up and Close

1. Finally we really like to thank you for your time and insight, it is much appreciated!
2. This concludes our inquiry - if anything else comes to your mind within the next days, feel free to drop us an email

## Appendix III.f – Remote Contextual Inquiry Template

**ID:** CI..  
**Date & Time:** ..  
**Interviewer:** ..  
**Observer:** ..  
**Recording:** ..

## Pre-Observation Questions

Job Title: ..  
 Responsibilities: ..  
 Gender: ☐ Female ☐ Male  
 Experience: in current job role: .. years with Smart Call Home: .. years  
 Educations: ..  
 ..  
 Country of work ..

## Observation Part

### Task A

**Situation:** You have been away for 2 weeks and are now (re-)starting work with your network  
**Problem:** For this you need to know, if any of your devices have generated a Diagnostic Smart Call Home Message while you were away  
**Your Task:** Get a list of all affected devices (if any)

**UI Path taken:** [screen] – link – [screen] – link – [screen] – link – [screen]  
**Total Time:** .... minutes

Notable Quotes:

Observations:

### Task B

**Situation:** A colleague mentions that the very first device you ever enrolled in Smart Call Home may be affected by a recent software EOX (end-of-life, end-of-sales, end-of-support, etc) announcement

**Problem:** He doesn't remember the hostname or any other details and can't verify himself

**Your Task:** Find out using Smart Call Home

**UI Path taken:** [screen] – link – [screen] – link – [screen] – link – [screen]

**Total Time:** ... minutes

Notable Quotes:

Observations:

### Post-Observation Questions

Complete questions which have not yet been answered during pre-observation or observation

- What are the main purpose / situations where you use Smart Call Home?
- Which of these (Smart Call Home Web App Overview screen) are you using?
- If there are un-mentioned major areas: ask follow-up question
- In the last few weeks, was there anything you wanted to do with Smart Call Home but couldn't?
- What was your most stressful experience where Smart Call Home was involved?
- What else would you like to do with Smart Call Home?
- 3 main strengths / weaknesses of Smart Call Home for your work?
  - +
  - +
  - +
- Who else do you interact with when using Smart Call Home?
- What other tools do you use when using Smart Call Home?
- Any other thoughts, comments or suggestions?

# Appendix IV – Completed Work

## Appendix IV.a – Stakeholder Interview 01 – Product Management

Note: Text of the email dialogue has deliberately not been spell-checked and edited.

**ID:** SI01  
**Date & Time:** 2009-06-29  
**Interviewer:** Bruno and Nadja  
**Recording:** email archive and transcript

The following is a transcript of the initial Stakeholder Interview with Smart Call Home product management:

### Introduction

- Quick intro to MAS HCID  
 (using <http://zur-filer01-web/users-b/bklauser/published/hcid/20090420-TeamCall-HCID-Intro-bklauser.ppt>)
- Update on scope of project (focus, thesis, methods, initial analysis, ...)

### Part I – Overall View

Q: How do you see the current product vision?

Transcript of Stakeholder Interview omitted from public version for confidentiality reasons.

Q: What are the main objectives / business drivers?

Transcript of Stakeholder Interview omitted from public version for confidentiality reasons.

Q: In your eyes, what are the main SWOTs?

Transcript of Stakeholder Interview omitted from public version for confidentiality reasons.

Q: Any plans for additional interfaces, user groups, etc. ?

Transcript of Stakeholder Interview omitted from public version for confidentiality reasons.

Q: To what extent do existing Cisco style guides apply (cco, kubrick, ...)?

Transcript of Stakeholder Interview omitted from public version for confidentiality reasons.

## Part II – Users

Transcript of Stakeholder Interview omitted from public version for confidentiality reasons.

## Part III – Study Project Logistics

Q: Is there statistical usage data / 'demographics' / etc beyond company names and devices types ?

Transcript of Stakeholder Interview omitted from public version for confidentiality reasons.

Q: Were any usability tests conducted? If yes, are there any results than can be shared?

Transcript of Stakeholder Interview omitted from public version for confidentiality reasons.

Q: Can we use our cco accounts for testing or do customer users see something different?  
(bklauser, cisco employee and nadj, non-cisco, non-partner guest)

Transcript of Stakeholder Interview omitted from public version for confidentiality reasons.

Q: How would you like to be involved / kept up to date?  
(document share, periodic email update, periodic calls, ...)

Transcript of Stakeholder Interview omitted from public version for confidentiality reasons.

## Interview Close

Q: What other question should I have asked?

Transcript of Stakeholder Interview omitted from public version for confidentiality reasons.

Q: Which other Stakeholders should we interview?

Transcript of Stakeholder Interview omitted from public version for confidentiality reasons.

## Appendix IV.b – Stakeholder Interview 02 – Product Management

**ID:** SI02  
**Date & Time:** 2009-09-02  
**Interviewer:** Bruno and Nadja  
**Recording:** email archive

This was a complementary interview closing open items from SI01 and seeking input from new product management.

## Appendix IV.c – Stakeholder Interview 03 – Development

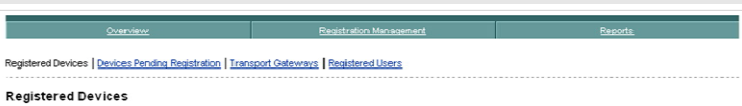
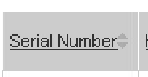
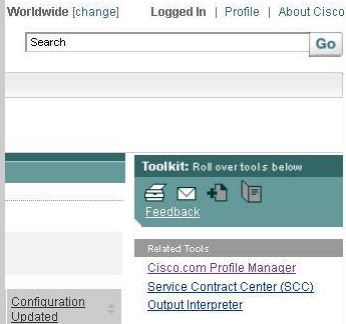
**ID:** SI03  
**Date & Time:** 2009-09-09  
**Interviewer:** Bruno and Nadja  
**Recording:** email archive

This was a complementary interview closing open items from SI01 and S02. The interview also served as a review for the draft Task Inventory and draft UI Flow Map.

## Appendix IV.d – HCI Expert Review

This is the full report of a HCI Expert Review based on the existing Smart Call Home web application. Key findings of this review have been included towards the consolidated findings and recommendations provided in 5.2 [Findings and Recommendations](#).

### Overall Comments

| ID   | Observation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Comments                                                                                                                  |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| ER01 | <p>⊗ The menu does not show where the user is standing at the moment. All links are underlined and in the same typo.</p>                                                                                                                                                                                                                                                                                                                                                                                 | User can get lost.                                                                                                        |
| ER02 | <p>⊗ The page is not consistent in how links and info popup are used throughout the page. Links are underlined but so are info points, the menu and table headers.</p> <p>Info Popup: </p> <p>Table Header: </p> <p>Menu Item: </p> <p>Link: </p> | Same typo should be for same functions. Info points and table headers are not links. The user can get a wrong impression. |
| ER03 | <p>⊗ Export to Excel or PDF is possible from certain pages. But there does not seem to be a rule of which information is to be exported and which isn't.</p>                                                                                                                                                                                                                                                                                                                                            |                                                                                                                           |
| ER04 | ⊗ On some pages the user name is shown, on some pages the user-id is shown.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                           |
| ER05 | Question: For which Personas are the pages, functions, messages and reports intended? What are the application differences between the logins?                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                           |
| ER06 | ⊗ Service requests are only accessible if user is viewing a report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                           |
| ER07 | ⊗ There is no logout functionality.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                           |
| ER08 | <p>⊗ Smart Call Home and surrounding Cisco.com elements are using the same style. Sometimes making it difficult to understand if/how they relate to each other (negative example: Profile):</p>                                                                                                                                                                                                                                                                                                         |                                                                                                                           |

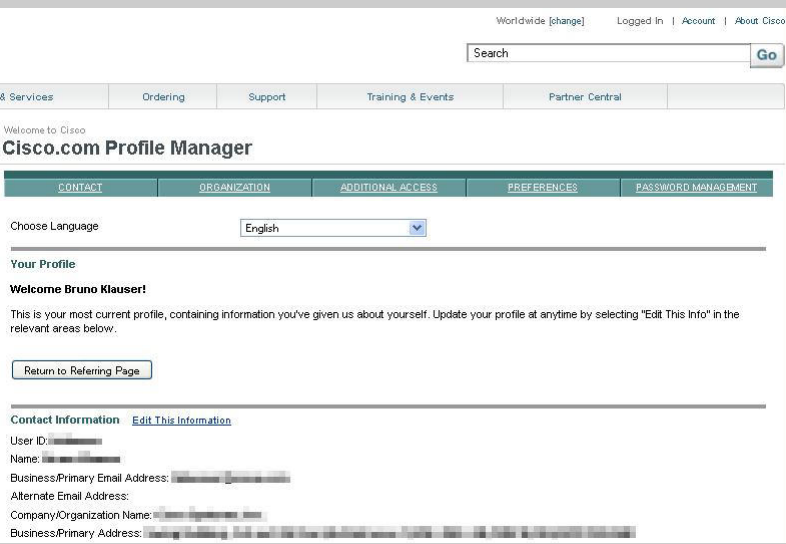
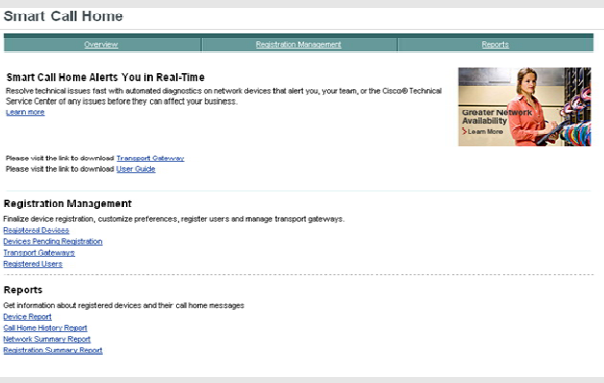
|      |                                                                                                                                                                                                                                                                                                         |  |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|      |                                                                                                                                                                                                                       |  |
| ER09 | <p>☺ Smart Call Home and surrounding Cisco.com elements are using the same style. Sometimes making it difficult to understand if/how they relate to each other (positive example: Print): Printing a Smart Call Home report formats nicely and includes the Smart Call Home frame only, no clutter.</p> |  |

Table 21 – HCI Expert Review – Overall Comments

## Overview Area

| ID   | Observation                                                                                                                                                                | Comments                                        |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| ER10 | <p>☹ The menu is listed twice, once on top, one on the left hand side of the body.</p>  | Too much and redundant text may distract a user |
| ER11 | <p>☺ Short explanation on what Smart Call Home is.</p>                                  |                                                 |
| ER12 | <p>☺ Link to User Guide is prominent on the first page</p>                              |                                                 |
| ER13 | <p>☺ The menu of the User Guide is very clearly arranged.</p>                                                                                                              |                                                 |

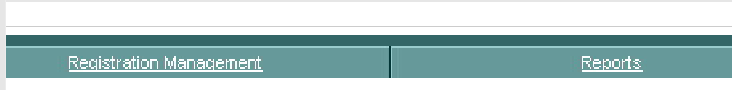
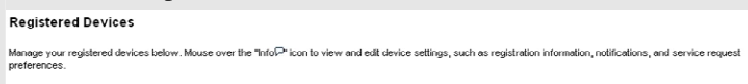
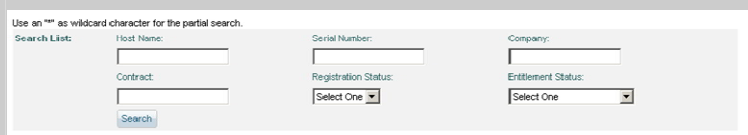
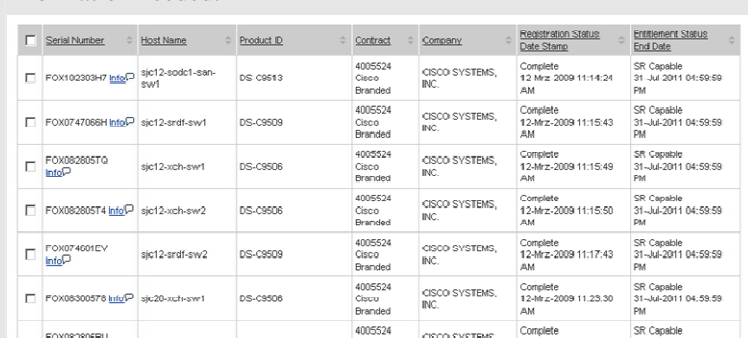
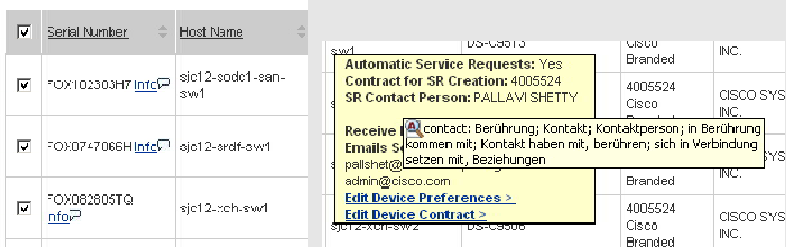
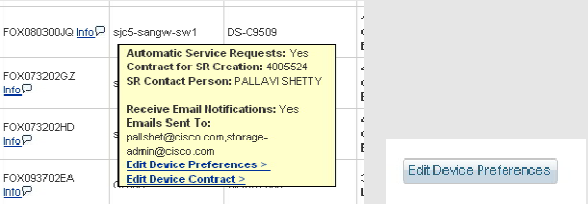
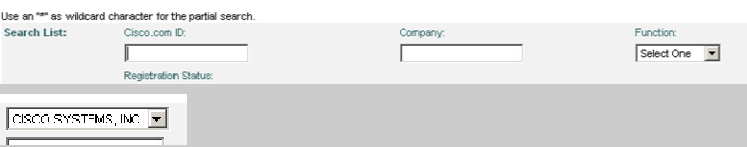
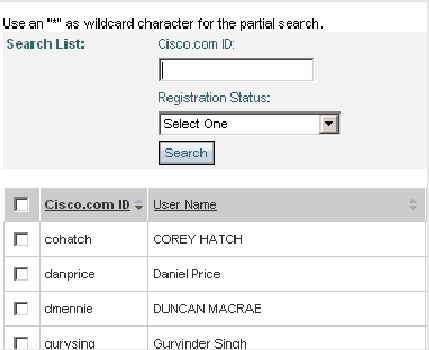
|      |                                                                                                                                                                                                                   |                                            |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
|      |                                                                                                                                 |                                            |
| ER14 | <p>☺ The two sections Registration Management and Reports divide the application very clearly and logically in two topics.</p>  | Very clear content arrangement, clear flow |

Table 22 – HCI Expert Review – Overview Area

## Registration Management Area

| ID   | Observation                                                                                                                                                                                       | Comments                                               |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| ER20 | <p>☺ Every section has a short and precise explanation about which information the user can expect to see.</p>  |                                                        |
| ER21 | <p>☺ The menu shows within which top-level area the user is located on the website at the moment.</p>          |                                                        |
| ER22 | <p>⊗ While top-level breadcrumb navigation is available, it does not include lower levels of navigation, making it difficult to understand exact location.</p>                                    | Consider Breadcrumb (as in ER21) for lower levels too. |
| ER23 | <p>☺ The Registered Devices search list is clear and well-arranged.</p>                                       |                                                        |
| ER24 | <p>☺ The registered devices are shown in a simple list with the necessary information needed.</p>             |                                                        |
| ER25 | <p>☺ The info sign is described on the top of the page. It wouldn't even need the description, the sign itself is very self-explanatory.</p>                                                      |                                                        |

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                       |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
|      |  <p>Manage your registered devices below. Mouse over the "Info" icon to view and edit device settings, such as registration information, notifications, and service request preferences.</p>                                                                                                                                                              |                                                                                                       |
| ER26 | <p>☺ The devices can be managed by itself, in groups or all at once by ticking the checkboxes.</p>                                                                                                                                                                                                                                                        |                                                                                                       |
| ER27 | <p>☹ On this page an export to Excel or a PDF-format is not available.</p>                                                                                                                                                                                                                                                                                                                                                                  | Unexpected, not consistent with other similar pages.                                                  |
| ER28 | <p>The info field contains two functions:</p> <ul style="list-style-type: none"> <li>- Edit Device Preferences</li> <li>- Edit Device Contract</li> </ul> <p>However, there is only one button on the bottom of the page where the device preferences for more than one device can be viewed. Contracts for more than one device can not be viewed.</p>  | Is this intentional?                                                                                  |
| ER29 | <p>☹ Search Users – on all other pages, the field Company is a dropdown, showing the different companies.</p>                                                                                                                                                                                                                                           | This is not consistent. A dropdown would be quicker.                                                  |
| ER30 | <p>The user name is not available as a search criteria.</p>                                                                                                                                                                                                                                                                                              | Wouldn't users want to search for the user name rather than the cisco.com id? Consider offering both. |
| ER31 | <p>☹ There is a Time stamp listed for every user, but no explanation to what the time indicates.</p>                                                                                                                                                                                                                                                                                                                                        | Last active time stamp?<br>Registration time stamp?                                                   |

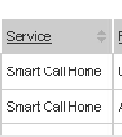
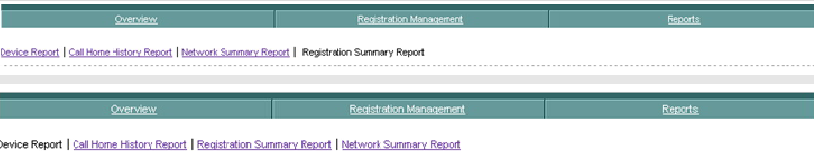
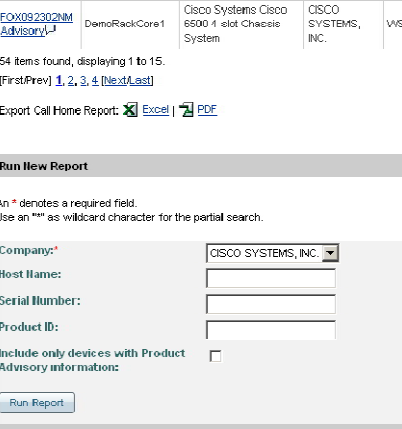
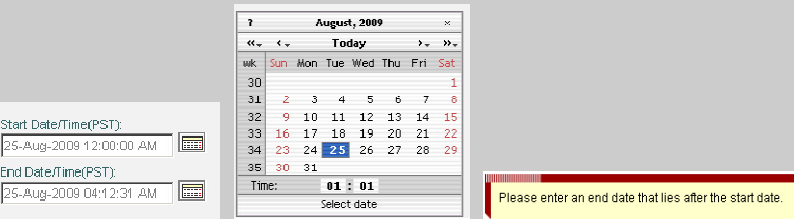
|      |                                                                                                                                      |                                     |
|------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
|      |                                                     |                                     |
| ER32 | <p>⊗ There is a service listed for every user.</p>  | Are there other services available? |

Table 23 – HCI Expert Review – Registration Management Area

## Reports Area

| ID   | Observation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Comments               |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| ER40 | <p>⊗ Depending on which page the user is on, the top-level breadcrumb menu items change their order:</p>                                                                                                                                                                                                                                                                                                                                                                                        |                        |
| ER41 | <p>☺ A new report can be processed in an already generated report. User does not have to change the page.</p>                                                                                                                                                                                                                                                                                                                                                                                  | Short interaction-flow |
| ER42 | There are no reports available for Transport Gateways                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Conscious Decision?    |
| ER43 | <p>⊗ Call Home History Report Search Mask: some small inconveniences, questions related to the Report Time Window (Start and End Time):</p> <ul style="list-style-type: none"> <li>- by default, end time is set before start time (which is invalid)</li> <li>- the set time window is reset to defaults in the result page, making repeated searches for the same time window cumbersome</li> <li>- the display shows seconds, however the popup does not allow setting seconds</li> </ul>  |                        |
| ER44 | ⊗ From the search page it is not visible how long back the history is archived.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Consider limiting to   |

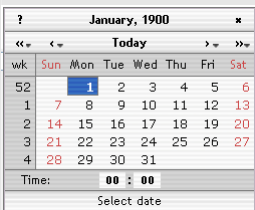
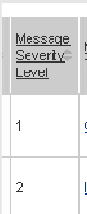
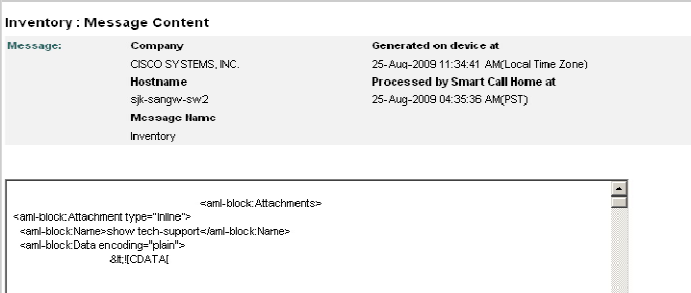
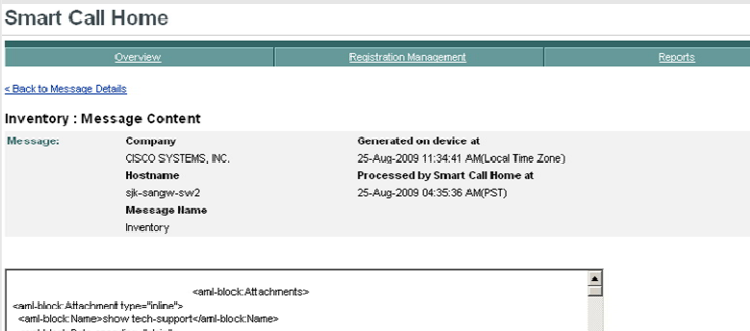
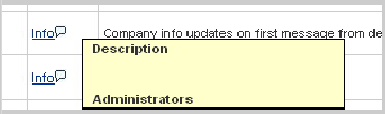
|      |                                                                                                                                                                                                                                                                             |                                                                                                                                                                                      |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      | <p>The calendar allows for setting time windows very far back in history – long before even the Turing machine was invented.</p>                                                           | <p>the actually available history – also in addition to &lt;, &gt;, &lt;&lt;, and &gt;&gt; elements add  &lt;&lt; and &gt;&gt;  pointing to the first and last message timestamp</p> |
| ER45 | <p>⊗ User can choose a start date which lies in the future.</p>                                                                                                                                                                                                             | <p>Consider making input more restrictive.</p>                                                                                                                                       |
| ER46 | <p>⊗ The message severity level is not explained. What do the numbers mean?</p>                                                                                                            | <p>Consider adding legend information</p>                                                                                                                                            |
| ER47 | <p>⊗ The location is not clear when opening the message header or the device output of the Message/Result. There are no titles when viewing the messages.</p>                             |                                                                                                                                                                                      |
| ER48 | <p>⊗ The location of the page 'Message content' is not clear. The breadcrumb menu on the top has disappeared.</p>                                                                       |                                                                                                                                                                                      |
| ER49 | <p>⊗ Transport Gateways: The info symbol is shown even when the gateway does not have any description. Advisory popups in device reports are only shown if information is available</p>  | <p>Not consistent</p>                                                                                                                                                                |
| ER50 | <p>Transport gateway Preferences (set via the TG software GUI) are not visible nor editable from the Smart Call Home Web Application</p>                                                                                                                                    | <p>Conscious Decision?<br/>Maybe provide a 'link'</p>                                                                                                                                |

Table 24 – HCI Expert Review – Reports Area

## Surfing Oscar



# Partner Engineer – Eager Peter



The collage features several images: a man in a suit and glasses, a man working on a laptop in a home office, a server room, a man holding a stack of books including 'Pro MySQL', a man holding a can of Red Bull, a man holding a mobile phone, a silver car, a car's interior, and a cartoon illustration of a man thinking and a group of people celebrating.

**Cisco webex**

# Support Engineer – Rational Sue

**Troubleshooting Flowchart**

```

graph TD
    Start([Start]) --> Q1{Can the issue  
reproduce?}
    Q1 -- No --> End([End])
    Q1 -- Yes --> T1[True path  
AKA IT]
    T1 --> Q2{Can you  
reproduce it?}
    Q2 -- No --> End
    Q2 -- Yes --> T2[True path  
AKA IT]
    T2 --> Q3{Web page  
searched?}
    Q3 -- No --> End
    Q3 -- Yes --> T3[True path  
AKA IT]
    T3 --> End
  
```

**Also: several of the profiles at**  
<http://www.rational.com/webex/training/courses/support-engineering-connection-program/07/resourcescenter/026/enrscenach.html>

## Appendix IV.f –Provisional Personas

### Surfing Oscar

Age: 28  
Job: Network Operator for the last 4 years  
Work hours: Shift, from 6am – 2pm or from 2pm – 10pm  
Education: Technical School, Technician  
Hobbies: Kite-Surfing

### Superior Edison

Age: 38  
Job: Network Engineer for the last 4 years  
Work hours: 8.30am – 7pm, sometimes on weekends  
Education: Information Technology ETH  
Hobbies: Motorcycling

### Eager Peter

Age: 46  
Job: Partner Engineer at a System Integrator with Cisco Gold Partner Status (since 8 years)  
Work hours: Flexible  
Education: Masters in Engineering, CCIE Certification,  
Security Specialist Certification, Linux RHCE Certification, ITIL Foundation Certificate  
Hobbies: Traveling, Marathon Running, Home Automation

### Rational Sue

Age: 35  
Job: Customer Support Engineer at Cisco Technical Assistance Center (since 3 years)  
Work hours: Shift, ...  
Education: Bachelor in Engineering, CCIE Certification, Practical Experience as a Network Operator  
Hobbies: Mountaineering, Hiking

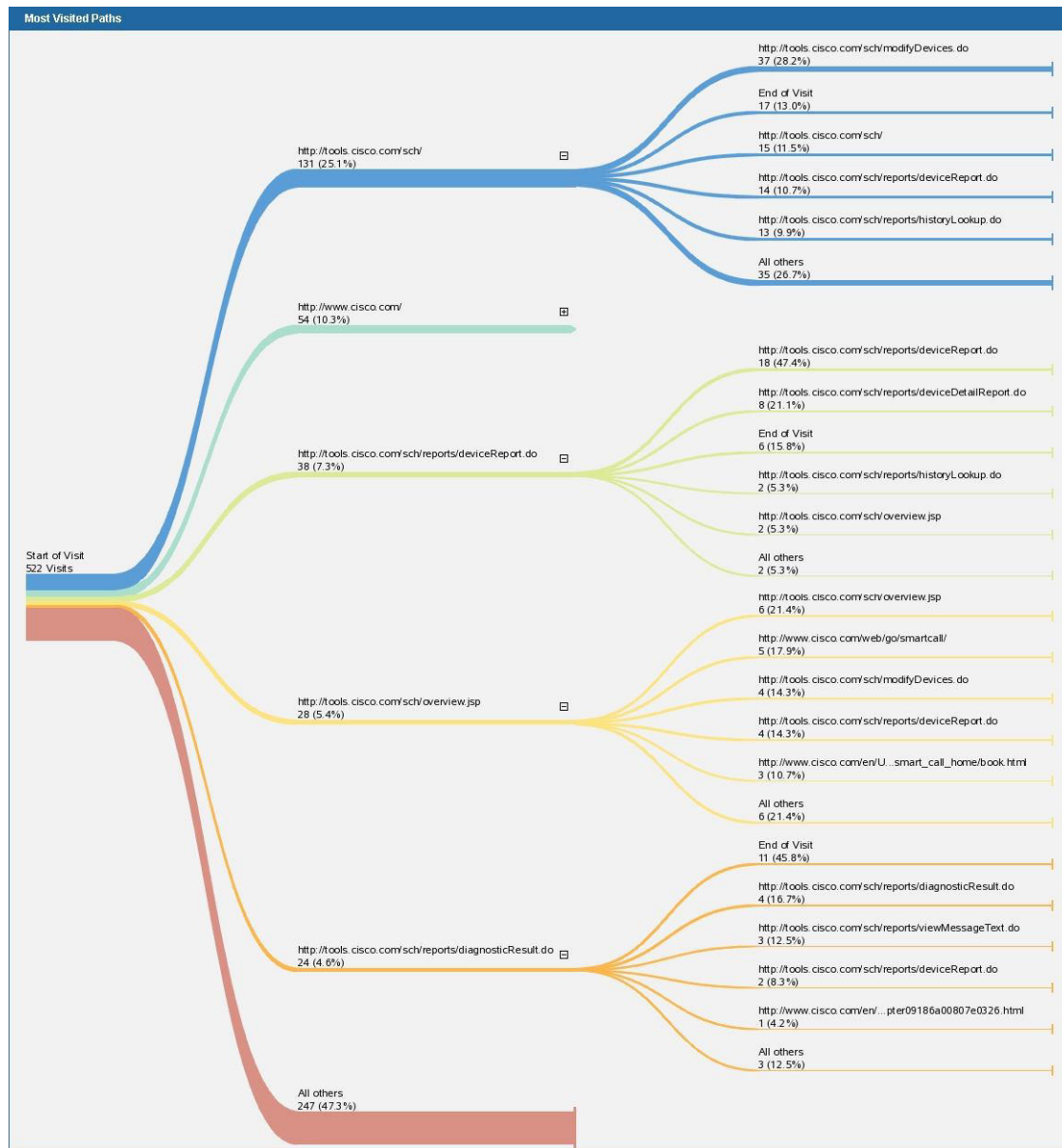
## Appendix IV.g – Task Flow Heatmap Input

The following examples illustrate the input obtained via a full monthly web analytics report based on Sept 2009 access data:

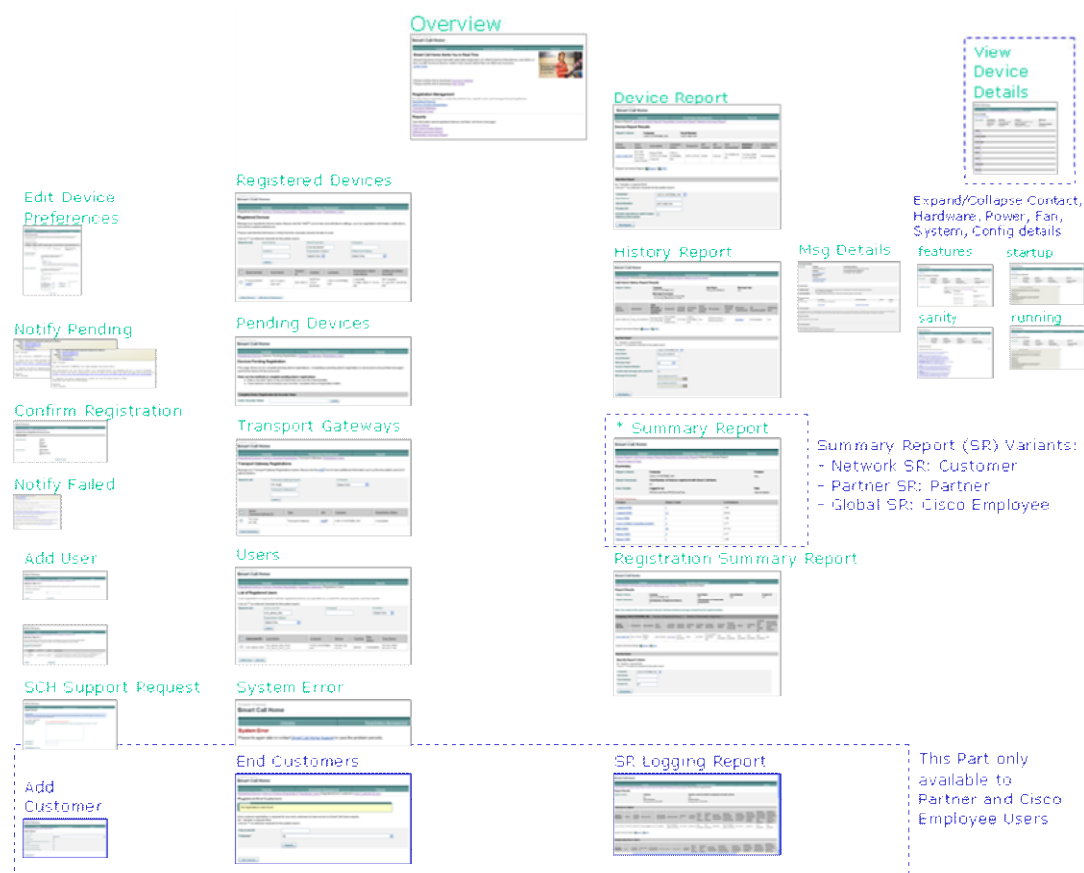


Further processing and combination was required, due to duplicate and errand entries:

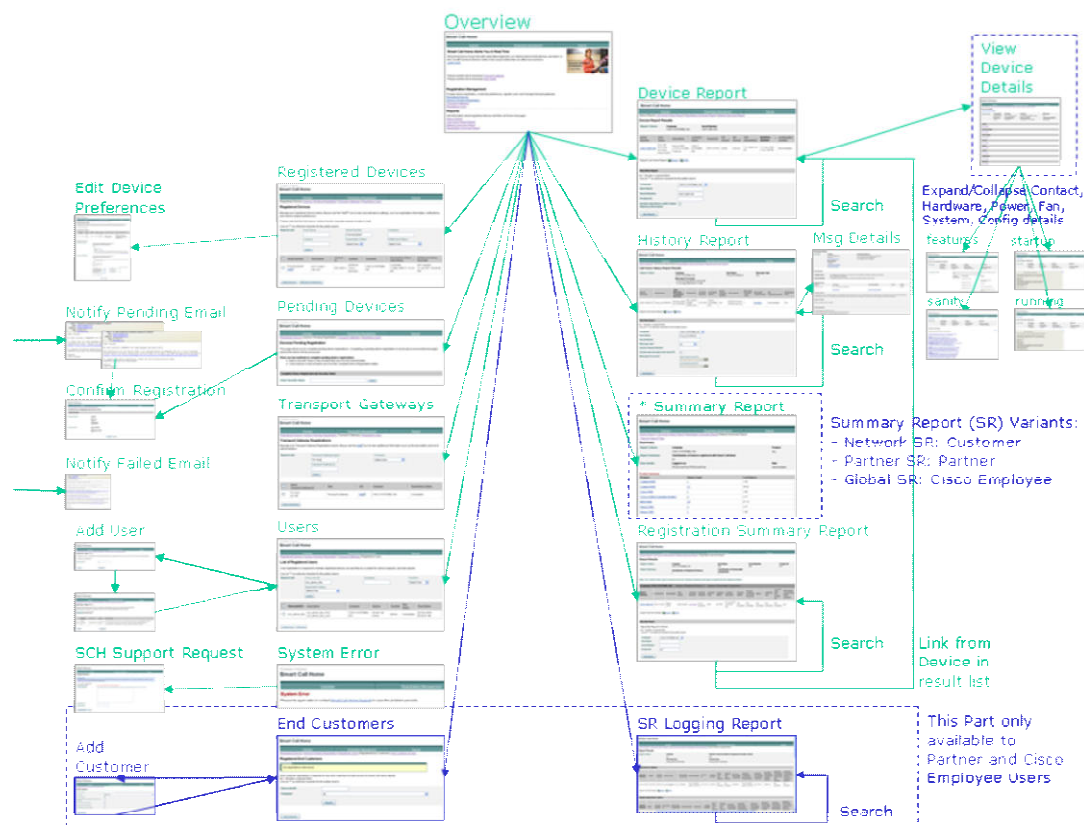
- Item #1 and #6 need to be combined
- Legal.do excluded from stats
- Bottom N includes some invalid links



## User Interface Map

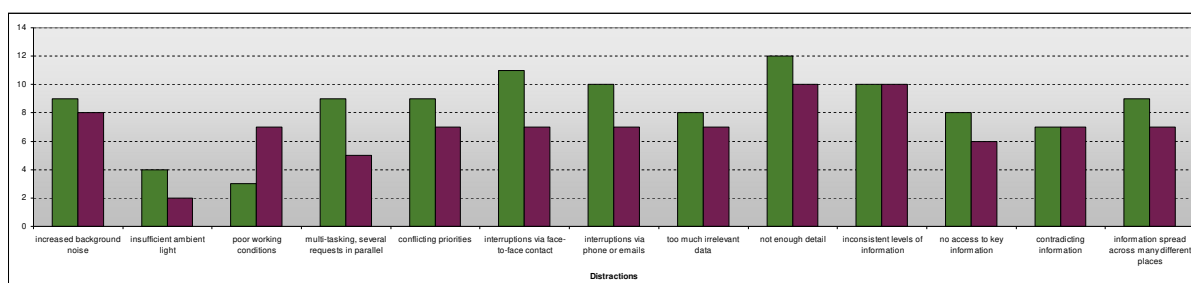
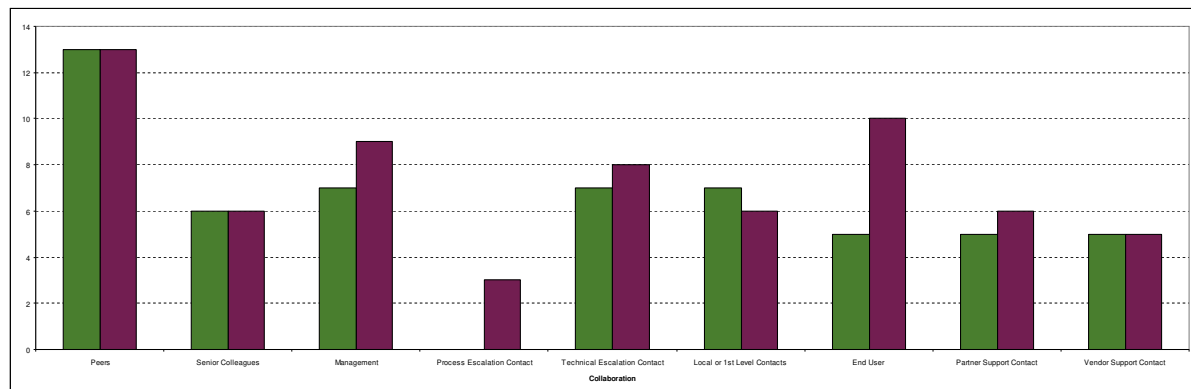
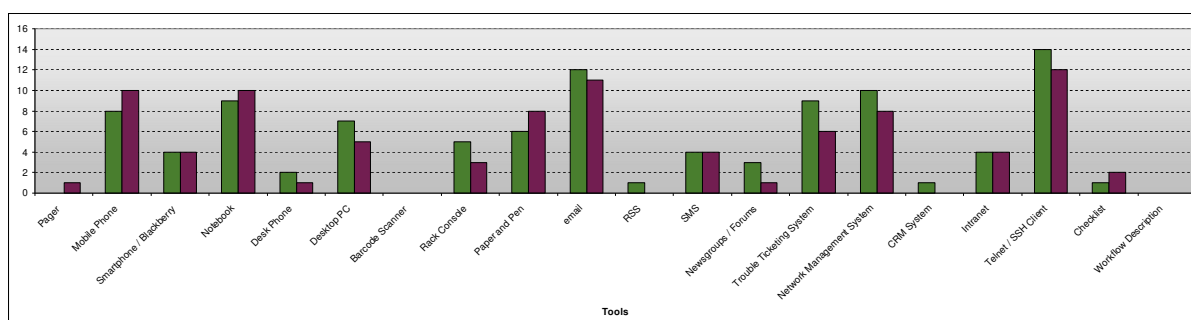
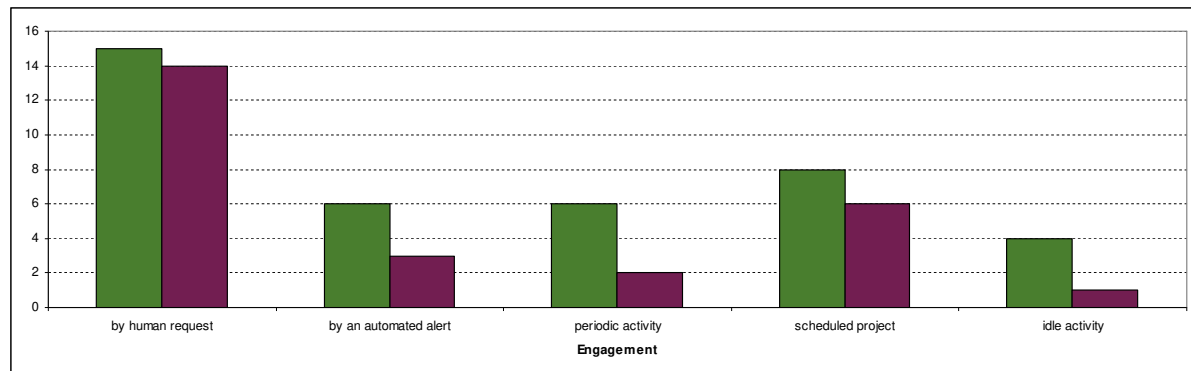


## User Interface Flow Map



## Appendix IV.h – Survey

### Evaluation Step 1



#### Legend:

- Green columns represent situation I
- Red columns represent situation II

## 128

[illegible]

## Appendix IV.i – Contextual Inquiries

### Remote Contextual Inquiry CIa1

**ID:** CIa1  
**Date & Time:** Wed, 2009-10-28, 2pm local time (7pm CET)  
**Interviewer:** Bruno  
**Observer:** Bruno  
**Recording:** SmartCallHome-UsabilityResearch-20091028-1802.arf

#### Pre-Observation Questions

**Job Title:** Systems Engineer SAN / SAN Engineer  
**Responsibilities:** Maintain the SAN network of a Healthcare organization  
 Engineering and ongoing operations  
**Gender:** ☐ Female ☒ Male  
**Experience:** in current job role: 2.5 years with Smart Call Home: 2 years  
**Education:** Used to own an MSCE Certification  
 Mostly on-the-job training  
**Country of work** USA, Central East

#### Observation Part

##### Task A

**Situation:** You have been away for 2 weeks and are now (re-)starting work with your network  
**Problem:** For this you need to know, if any of your devices have generated a Diagnostic Smart Call Home Message while you were away  
**Your Task:** Get a list of all affected devices (if any)

**UI Path taken:** (time 0:00) [Overview] – Device Report – [Device Report] – Run Report – [Device Report Results] – Serial Number of first Device – [Device Details] – Advisories Show Detail – **Call Home History Report – [Call Home History Report] – Run Report (time: 4:00) – [Call Home History Report Results] (time: 4:30)** – Reports – [Device Report] – Network Summary Report – [Network Summary Report] – Run Report – [Summary] – Call Home History Report – [Call Home History Report] – Run Report – [Call Home History Report Results] – Inventory Message of first Device – [Message Details] – View Device Output – [Inventory: Message Content]

**Total Time:** 9:30 minutes

#### Notable Quotes:

**Observations:** Initial attempt via Device Report takes 4 minutes, but produces no result  
 After 4:30 minutes, the user is looking at the right report, but is unsure if diagnostic messages would indeed be listed there.

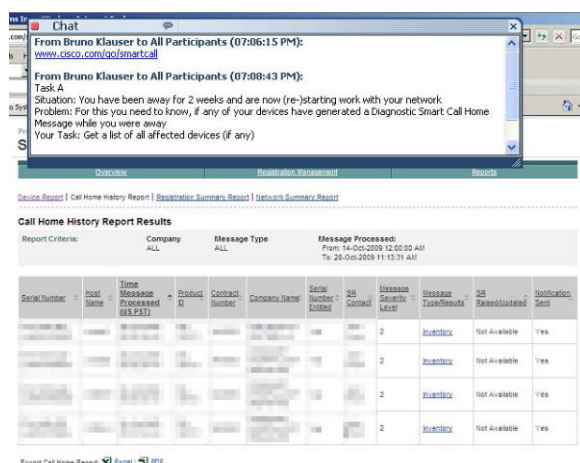


Figure 63 – After 4:30 minutes

Another 5 minutes are spent exploring various other areas to see if there is any mention of diagnostic messages.

## Task B

**Situation:** A colleague mentions that the very first device you ever enrolled in Smart Call Home may be affected by a recent software EOX (end-of-life, end-of-sales, end-of-support, etc) announcement

**Problem:** He doesn't remember the hostname or any other details and can't verify himself

**Your Task:** Find out using Smart Call Home

**UI Path taken:** (time 0:00) [Overview] – **Registered Devices** – **[Registered Devices]** – **Info of first Device**– [Info Popup] (remembers hostname of first enrolled device) – Overview – [Overview] – Device Report – [Specify Report Criteria] (types in hostname of first enrolled device) – Run Report – **[Device Report Results] (time 2:00)** – **Advisory** – **[Advisory popup]** – Hardware Field Notice within Advisory Popup – [Hardware Field Notice] (time 2:30)

**Total Time:** 2:30 minutes

**Notable Quotes:** <I would think that there would be something under 'Advisory' that would show the EOX, that would be my first > and <I would have to guess ...> upon browsing through Advisory information

**Observations:** The use is unsure if he is looking at the right place for EOX information

## Post-Observation Questions

Complete questions which have not yet been answered during pre-observation or observation

- What was your most stressful experience where Smart Call Home was involved?  
Re-registering devices upon an administrative glitch which caused the support contracts to expire.
- 3 main strengths / weaknesses of Smart Call Home for your work?
  - a lot of what I get here, I can generate on the switch locally
  - 
  - + it's good for reporting of notifications and alerts
  - +
  - +
- What other tools do you use when using Smart Call Home?

- Microsoft Outlook for emails coming in from Smart Call Home, using the direct link into the web application to check monthly inventory updates
- Cisco Switch Fabric Manager 4.2(1)

Note: there seems to be some uncertainty regarding the relation between Smart Call Home and the Call Home Configurations within Device Manager in Fabric Manager.

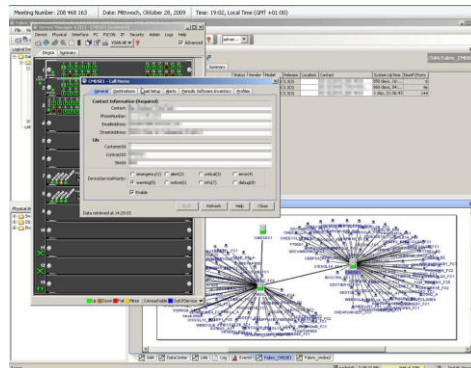


Figure 64 – Call Home Settings in Switch Fabric Manager

- Any other thoughts, comments or suggestions?

### Remote Contextual Inquiry CIb1

**ID:** CIb1  
**Date & Time:** Fri, 2009-10-30, 7:30am local time (12:30pm CET)  
**Interviewer:** Bruno  
**Observer:** Bruno  
**Recording:** none – this CI was cancelled 1hr before the meeting due to ‘unexpected issues’

### Remote Contextual Inquiry CIc1

**ID:** CIc1  
**Date & Time:** Tue, 2009-11-24, 10:30am local time (5:30pm CET)  
**Interviewer:** Bruno  
**Observer:** Bruno  
**Recording:** SmartCallHome-UsabilityResearch-20091124-1647.arf

### Pre-Observation Questions

**Job Title:** Manager Systems Engineering  
**Responsibilities:** Technical Lead, Manager and Individual Contributor, responsible for IT infrastructure including network (routing, switching, firewall) and servers, storage as well as helpdesk role  
**Gender:** ☐ Female ☒ Male  
**Experience:** in industry: 14 years  
 current job role: 3.5 years  
 with Smart Call Home: 3 months  
**Education:** main background is in networking, initially Nortel, then Cisco  
**Country of work:** USA, Texas

## Observation Part

## Task A

**Situation:** You have been away for 2 weeks and are now (re-)starting work with your network

**Problem:** For this you need to know, if any of your devices have generated a Diagnostic Smart Call Home Message while you were away

**Your Task:** Get a list of all affected devices (if any)

**UI Path taken:** (time 0:00) [Overview] – Device Report – [Specify Report Criteria] (user then uses SSH to get hostname and serial number – copy/paste hostname and serial number) – Run Report – [Device Report Results] – Serial Number – [Device Details] (time 2:10 minutes) – new login [Overview] – Call Home History Report – [Specify Report Criteria] (copies hostname and serial number from the SSH session with the switch, specifies 2 week time window, does not select message type Diagnostic) – Run Report – [Call Home History Report Results]

**Total Time:** 3:30 minutes

**Notable Quotes:** <I'll be honest, I haven't used this> @ 7:58min

→ The user does not recognize the web application from the Smart Call Home web page or overview screen, since he's so far only accessed it via the direct links within automated email notifications.

<I wouldn't go to this – I would go to my email and look for messages ...> @ 11:20min

→ After completing Task A. Clearly this user today prefers access the information based on email alerts.

**Observations:** Initial attempt via Device Report consumes 2:10 minutes but produces no result

Uses SSH @ 8:44min [Specify Device Report Criteria]

→ Rather than doing a Device Report for all devices, the user uses SSH to the actual switch in order to get hostname and serial number – which he then copies and pastes into the two search fields. Clearly the input form is not recognized as a context sensitive search tool. (This company only owns 1 switch registered with Smart Call Home).

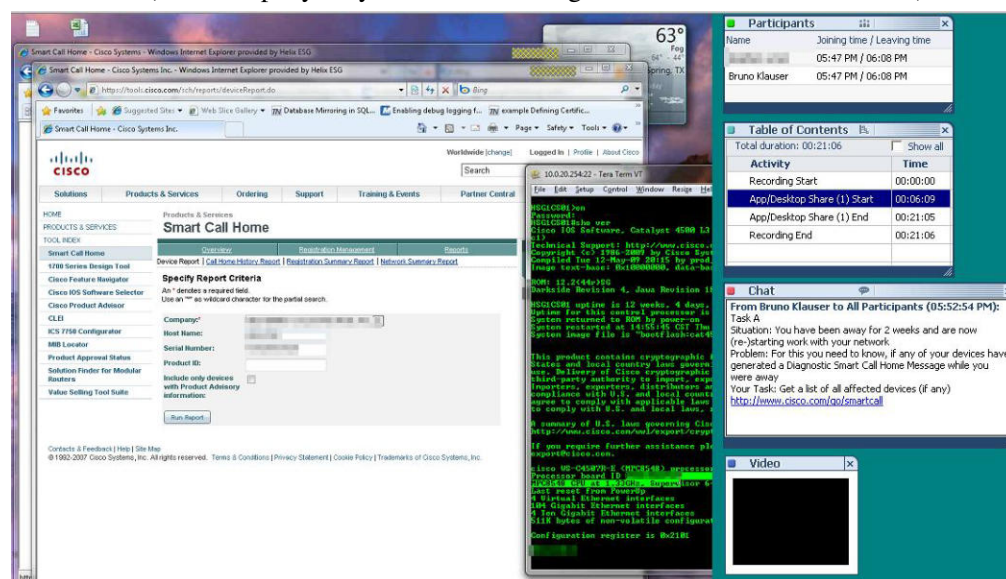


Figure 65 – 8:45 minutes

## Task B

**Situation:** A colleague mentions that the very first device you ever enrolled in Smart Call Home may be affected by a recent software EOX (end-of-life, end-of-sales, end-of-support, etc) announcement

**Problem:** He doesn't remember the hostname or any other details and can't verify himself

**Your Task:** Find out using Smart Call Home

**UI Path taken:** (time 0:00) [Overview] – Device Report – [Specify Report Criteria] (copies hostname and serial number from the SSH session with the switch) – Run Report – [Device Report Results] – Serial Number – [Device Details] – expand System Show Details ... abort

**Total Time:** 1 minute (aborted)

**Notable Quotes:** <Software Version not available ?> @ 15:25min

→ The user is obviously surprised by the fact that the software version of his switch is not shown on the Device Details report. There is also no information why this might be the case.

**Device Report Results**

| Report Criteria: |           | Company                            |              | Host Name   |            | Serial Number |                 |                         |                         |
|------------------|-----------|------------------------------------|--------------|-------------|------------|---------------|-----------------|-------------------------|-------------------------|
|                  |           | HELIX ENERGY SOLUTIONS GROUP, INC. |              | hsg1cs01    |            | FOX1306GPSN   |                 |                         |                         |
| Serial Number    | Host Name | Description                        | Company Name | Product ID  | HW Version | SW Version    | Part Number/Rev | Inventory Updated       | Configuration Updated   |
|                  |           | Not Available                      |              | WS-C4507R-E | 1.1        | Not Available | 73-9975-04      | 20-Nov-2009 02:59:00 PM | 20-Nov-2009 03:00:00 PM |

Figure 66 – 15:25 minutes

<... in this instance I would go to the switch and do a software advisory> @ 15:45min

→ confused by none of the version info being displayed, the user decides to abort the task and solve it by doing a software advisory from the switch.

**System Details:**

|                     |               |
|---------------------|---------------|
| Processor           | Not Available |
| System Image Name   | Not Available |
| OS Version          | Not Available |
| Feature Set:        | Not Available |
| ROM Version:        | Not Available |
| Main Memory         | OK            |
| Non Volatile Memory | Not Available |
| Last Restart Time   | Not Available |
| Last Restart Reason | Not Available |
| Last Reset Reason   | Not Available |
| System Uptime       | Not Available |
| Config Register:    | Not Available |

Figure 67 – 15:45 minutes

**Observations:** It seems not entirely clear to the user why they are not seeing version information nor where EOX alerts would be displayed.

Complete questions which have not yet been answered during pre-observation or observation

- What are the main purpose / situations where you use Smart Call Home?  
Started using after implementing resilience (after hurricane) in order to improve availability of switching infrastructure by getting automated emails and triggering Cisco Support automatically and in real time before manual intervention.
- Which of these (Smart Call Home Web App Overview screen) are you using?  
Only accessed it from the links within automated email (inventory) notifications from Smart Call Home.
- 3 main strengths / weaknesses of Smart Call Home for your work?
  - no negative experience                               + ability to alert Cisco upon HW failure,
  - +
  - +
- Who else do you interact with when using Smart Call Home?  
nobody
- What other tools do you use when using Smart Call Home?
  - Solarwinds Event Management
  - WhatsUp Gold NMS
  - Altiris Trouble Ticketing System
- Any other thoughts, comments or suggestions?  
They learned about the feature pretty much by chance. When they approached their partner (a large US channel partner) they were apparently their first customer using Smart Call Home.

<I think it's a really good feature> @ 20:15min  
(makes a comment about the feature not being widely known)

|                         |                                                  |
|-------------------------|--------------------------------------------------|
| <b>ID:</b>              | CId1                                             |
| <b>Date &amp; Time:</b> | Mon, 2009-11-30, 10:00am local time (9:00am CET) |
| <b>Interviewer:</b>     | Bruno                                            |
| <b>Observer:</b>        | Bruno                                            |
| <b>Recording:</b>       | Candidate did not agree to recording             |

|                   |                                                                                                                   |                                          |
|-------------------|-------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Job Title:        | Manager Network and Services                                                                                      |                                          |
| Responsibilities: | Team Lead of 20, Technical Lead responsible for IP MPLS Core, Technical Infrastructure, Access, Cooling and Power |                                          |
| Gender:           | <input type="checkbox"/> Female                                                                                   | <input checked="" type="checkbox"/> Male |
| Experience:       | in current job role: 5 years                                                                                      | with Smart Call Home: 1 month into pilot |
| Educations:       | Bachelor of Telecoms<br>Currently Masters in progress<br>owns a CCNP Certification                                |                                          |
| Country of work   | Finland                                                                                                           |                                          |

## Observation Part

### Task A

Situation: You have been away for 2 weeks and are now (re-)starting work with your network  
 Problem: For this you need to know, if any of your devices have generated a Diagnostic Smart Call Home Message while you were away  
 Your Task: Get a list of all affected devices (if any)

UI Path taken: [Overview] – **Call Home History Report** – **[Call Home History Report]** – **(does not specify 2 week time period) Run Report** – **[Call Home History Report Results]** **(no data found)** – Device Report – [Device Report Details] – Run Report – [Device Report Results]

Total Time: 5 minutes

Notable Quotes: <this is nagging my browser> upon having to click away browser security warnings due to the fact that the Smart Call Home overview page seems to use a combination of both HTTP and HTTPS content.

Observations: User goes directly to the correct report, but does not specify a date/time range of 2 weeks. There were no Smart Call Home messages within the default range, hence no data is found: After quickly also browsing the Device Report, the user therefore (wrongly) concludes there were no Diagnostic Smart Call Home messages in the last 2 weeks.

### Task B

Situation: A colleague mentions that the very first device you ever enrolled in Smart Call Home may be affected by a recent software EOX (end-of-life, end-of-sales, end-of-support, etc) announcement  
 Problem: He doesn't remember the hostname or any other details and can't verify himself  
 Your Task: Find out using Smart Call Home

UI Path taken: [Overview] – **Device Report** – **[Device Report]** – **Run Report** – **[Device Report Results]** – **Advisory Popup** – **[SW EOX and Line Card EOX Details]**

Total Time: 4 minutes

Notable Quotes: <this popup keeps running away from me> upon having some difficulty to click the SW and HW EOX links within the auto-hiding advisory popup  
 <this is misleading> upon navigating through an IOS Software EOX advisory which is composed of 3 individual links to cisco.com with none of the information being relevant to the actual IOS image I use. (The customer uses 12.3(33)SRD3 while the software advisories seem to be for 12.2 mainline, 12.2(30)S and for a uBR7200 specific image)  
 <now this is what I expect> upon looking at the Line Card EOX information which lists the specific line card product ID in use

Observations: The user finds information quickly, but is distracted by his difficulties with the popup window and could not find out if/how the SW EOX information might be relevant and accurate for his device.  
 Also the lack of information in the SW EOX details screen force the user to navigate to

all three links and back:

Products & Services

Smart Call Home

Overview

Registration Management

Reports

Device Report | [Call Home History Report](#) | [Global Summary Report](#) | [Registration Summary Report](#) | [Service Request Logging Report](#)

Software End of Life/Sales/Support/Engineering Details

[Back to Report Results](#)

Device Details:

Serial Number

SW Version

12.2(33)SRD3

Host Name

Part Number/Rev

73-10721-01

Product ID

Inventory Updated

CISCO7609-S  
23-Nov-2009 07:00:00 AM

HW Version

Configuration Updated

1.0  
23-Nov-2009 07:00:00 AM

Product Advisory

Advisory Date

[SW EOL Alerts](#)

12-Dec-2006 12:00:00 AM

[SW EOL Alerts](#)

19-Mar-2006 12:00:00 AM

[SW EOL Alerts](#)

07-May-2002 12:00:00 AM

Export Call Home Report: [Excel](#) | [PDF](#)

Figure 68 – Software Advisory – Issues with Overview and Relevance

## Post-Observation Questions

Complete questions which have not yet been answered during pre-observation or observation

- What are the main purpose / situations where you use Smart Call Home?
 

We are 1 month into a pilot with a single device – our Account manager made us aware of this feature – but I hope to enroll more devices so that some of the infrastructure support workload moves from my team to Cisco.
- 3 main strengths / weaknesses of Smart Call Home for your work?
 

|                                 |                                                   |
|---------------------------------|---------------------------------------------------|
| - difficult to use              | + very easy to enroll and register a device       |
| - sometimes unclear information | + the concept is the best part of Smart Call Home |
| -                               | + move some network support load off my team      |
- What other tools do you use when using Smart Call Home?
 

No EMS in place, proactive monitoring tool, CLI, email
- Any other thoughts, comments or suggestions?

## Remote Contextual Inquiry C1e1

**ID:** C1e1  
**Date & Time:** Mon, 2009-12-01, 10:00am local time (5:00pm CET)  
**Interviewer:** Bruno  
**Observer:** Bruno  
**Recording:** SmartCallHome-UsabilityResearch-20091201-1559.arf

## Pre-Observation Questions

**Job Title:** Network Design Engineer  
**Responsibilities:** LAN Networking, Security within a team of 6  
**Gender:** ☐ Female ☒ Male  
**Experience:** in current job role: 4 years with Smart Call Home: 1 week into pilot  
**Educations:** local training classes  
 mostly on the job training,  
 no certifications  
**Country of work** USA, Texas

## Observation Part

### Task A

**Situation:** You have been away for 2 weeks and are now (re-)starting work with your network

**Problem:** For this you need to know, if any of your devices have generated a Diagnostic Smart Call Home Message while you were away

**Your Task:** Get a list of all affected devices (if any)

**UI Path taken:** [Overview] – **Call Home History Report** – **[Call Home History Report]** – (specifies 2 week time period, includes only messages which raised an SR) – **Run Report** – **[Call Home History Report Results]** (no data found) – Device Report – [Device Report Details] – Run Report – [Device Report Results]

**Total Time:** 4 minutes

**Notable Quotes:** <Well – I’ve never done this before – so ...>

**Observations:** user sets the checkbox to limit search to messages which have raised a service request. Therefore no data is found and the user wrongly concludes there are no matching messages. The Call Home History Result screen re-initializes the search mask, therefore the fact that this checkbox was set is not visible anymore:

### Task B

**Situation:** A colleague mentions that the very first device you ever enrolled in Smart Call Home may be affected by a recent software EOX (end-of-life, end-of-sales, end-of-support, etc) announcement

**Problem:** He doesn't remember the hostname or any other details and can't verify himself

**Your Task:** Find out using Smart Call Home

**UI Path taken:** [Overview] – **Device Report** – **[Device Report]** (does NOT run the report) – Network Summary Report – [Network Summary Report] (considering to give up) – overview – [Overview] – **Registered Devices** – **[Registered Devices]** – sort by time stamp – **[Registered Devices]** (copies hostname of first device) – **Reports** – **[Device Report]** (pastes hostname into search field) – **Run Report** – **[Device Report Results]** – **Advisory Popup** – Hardware Field Notices – [Hardware Field Notice] – Back to Report Results – [Device Report Results] – **Advisory Popup** – **[SW EOX Details]**

**Total Time:** 5:30 minutes

**Notable Quotes:** <these alerts I'd like to be able to take seriously>  
<if you get too many false positives people are going to start ignoring them> when discussing strengths and weaknesses. Some advisories and recommendations (config

sanity analysis was mentioned as an example and also a Software EOX alert was for hybrid software while they are running native only) do not seem to be relevant – so the user categorizes them as false positives.

Observations: Several software EOX Alerts are listed on the Software EOX Details page, at least one of them is not relevant to the device and it's configuration (ie.: the alert is about 12.2SX hybrid IOS while the switch is running 12.2(33)GXH2 native IOS – this user actually called TAC to verify that the alert is indeed a false positive)

### Post-Observation Questions

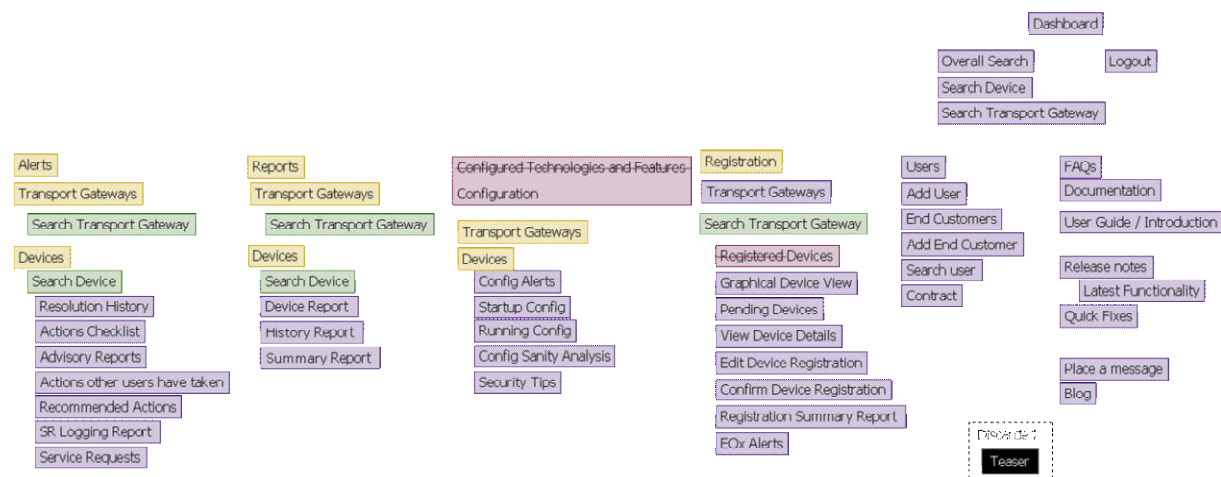
Complete questions which have not yet been answered during pre-observation or observation

- In the last few weeks, was there anything you wanted to do with Smart Call Home but couldn't? not yet – I just registered all the switches I can – the ones I can't were restricted because IOS isn't up to the level it needs to be. Also I'm getting double emails for some reason.
- 3 main strengths / weaknesses of Smart Call Home for your work?
  - false positives reported by config sanity analysis + being able to do the reports and see if anything is wrong
  - ... + look at the configs and see all the modules on a device
  - + ...
- Who else do you interact with when using Smart Call Home?  
Individually only, setting it up for other team members to use
- What other tools do you use when using Smart Call Home?  
CiscoWorks LMS 2.6, WhatsUpGold, Cisco WCS, Cisco CTC, email, word, excel, access
- Any other thoughts, comments or suggestions?

## Appendix IV.k – Card Sortings

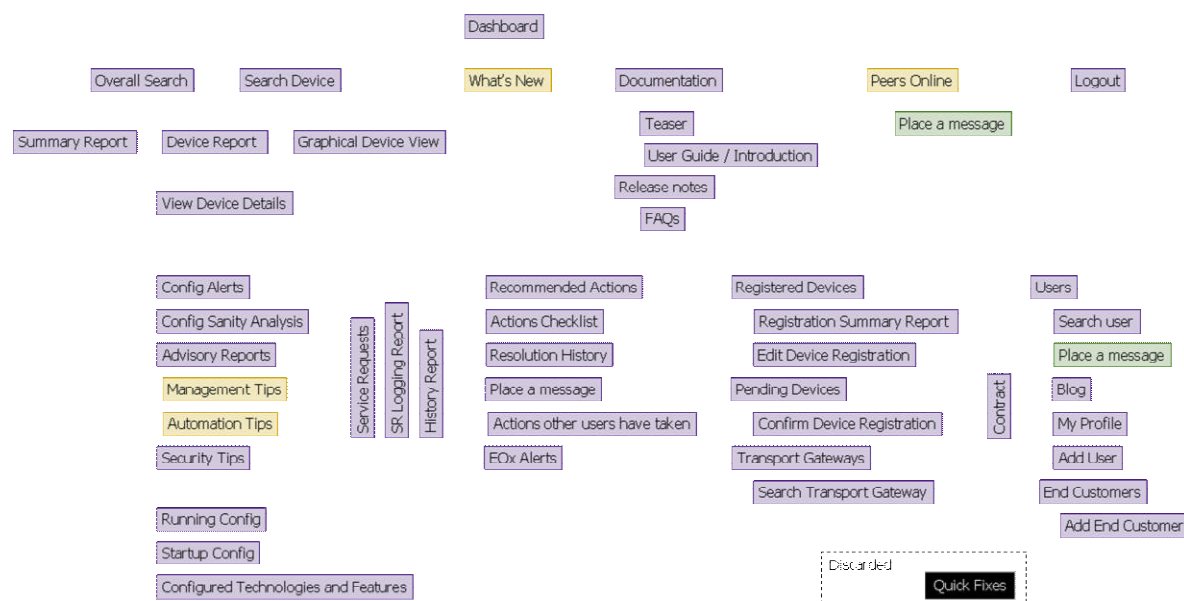
### Card Sorting CSa1

**ID:** CSa1  
**Interviewer:** Bruno  
**Company / Market:** SMB public sector  
**Role:** End Customer  
**Current User:** no  
**Method:** face-to-face

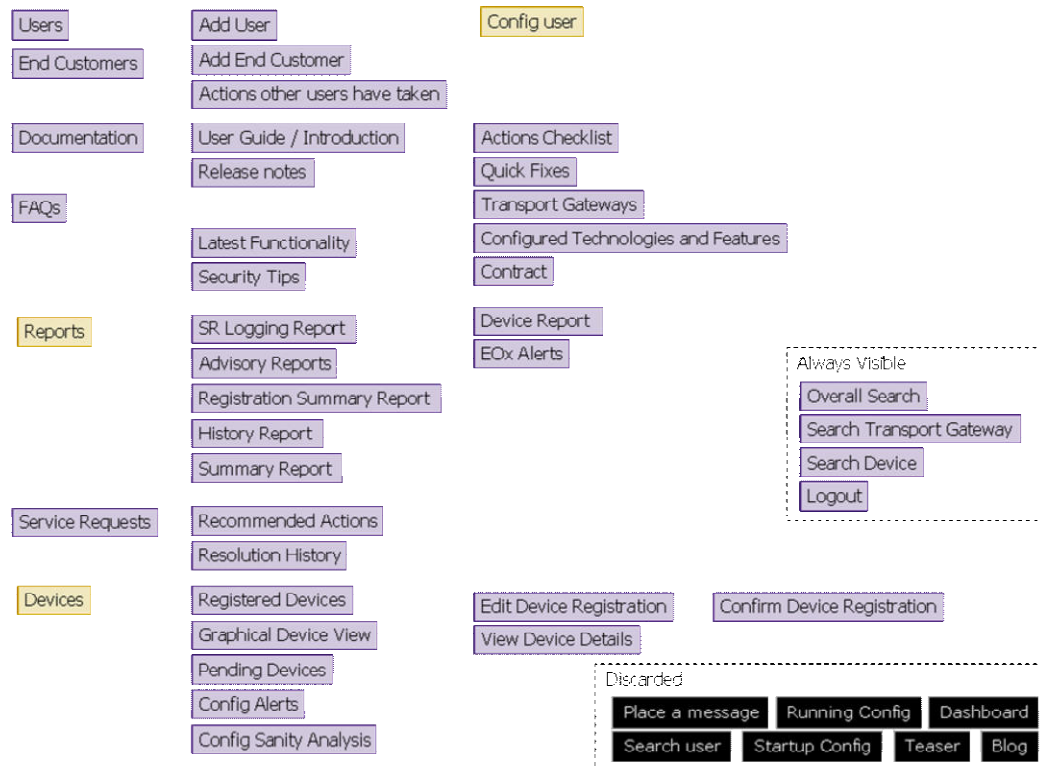


### Card Sorting CSb1

**ID:** CSb1  
**Interviewer:** Nadja  
**Company / Market:** Cisco  
**Role:** Partner  
**Current User:** yes  
**Method:** face-to-face

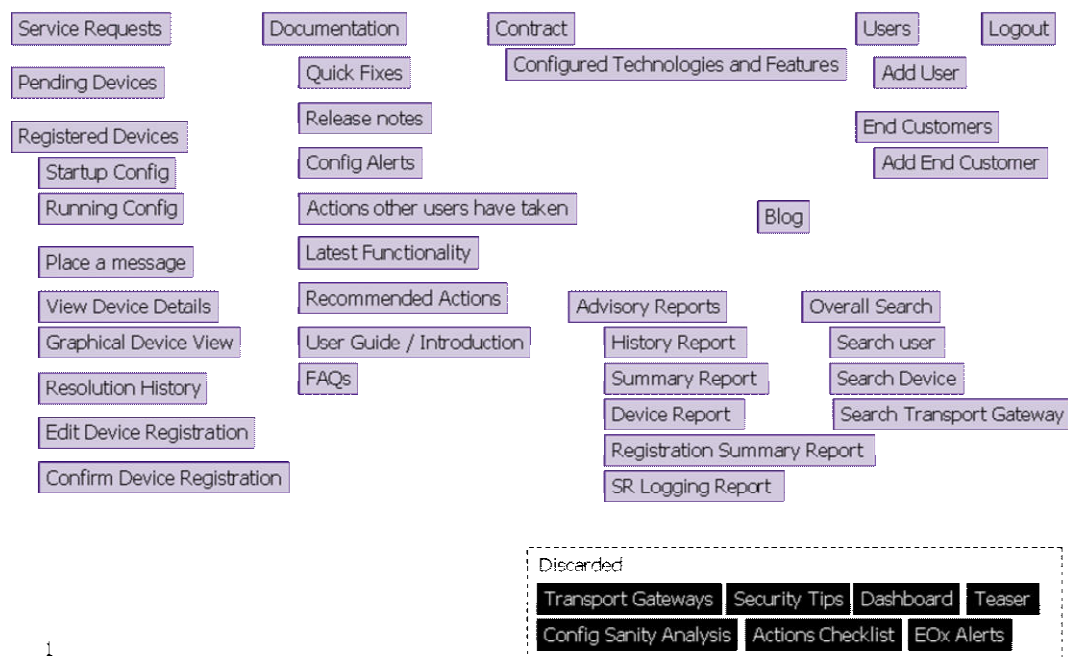
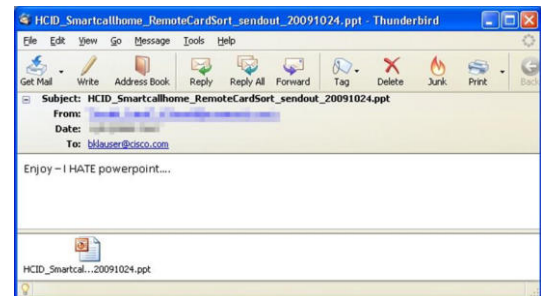






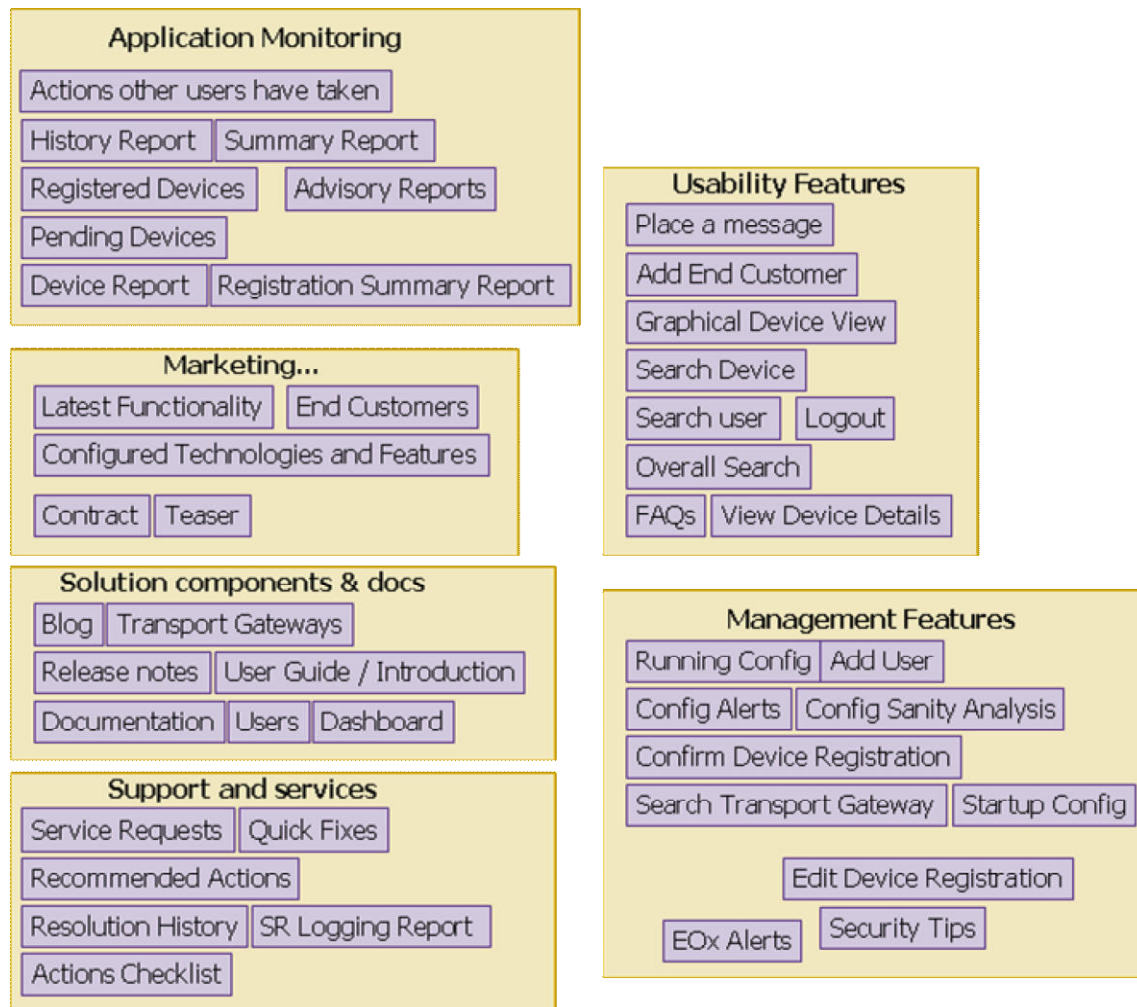
## Remote Card Sorting CSd1

**ID:** CSd1  
**Interviewer:** Bruno  
**Company / Market:** SMB, Health Care  
**Role:** End Customer  
**Current User:** yes  
**Method:** remote



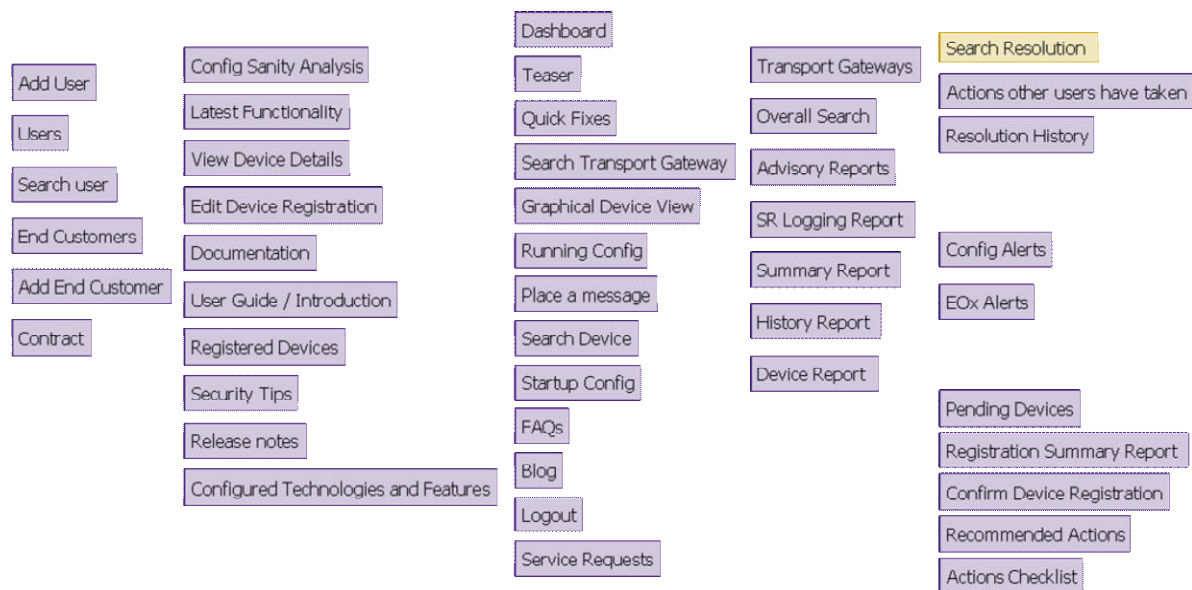
## Remote Card Sorting CSb3

**ID:** CSb3  
**Interviewer:** Bruno  
**Company / Market:** Cisco  
**Role:** Support Engineer  
**Current User:** no  
**Method:** remote



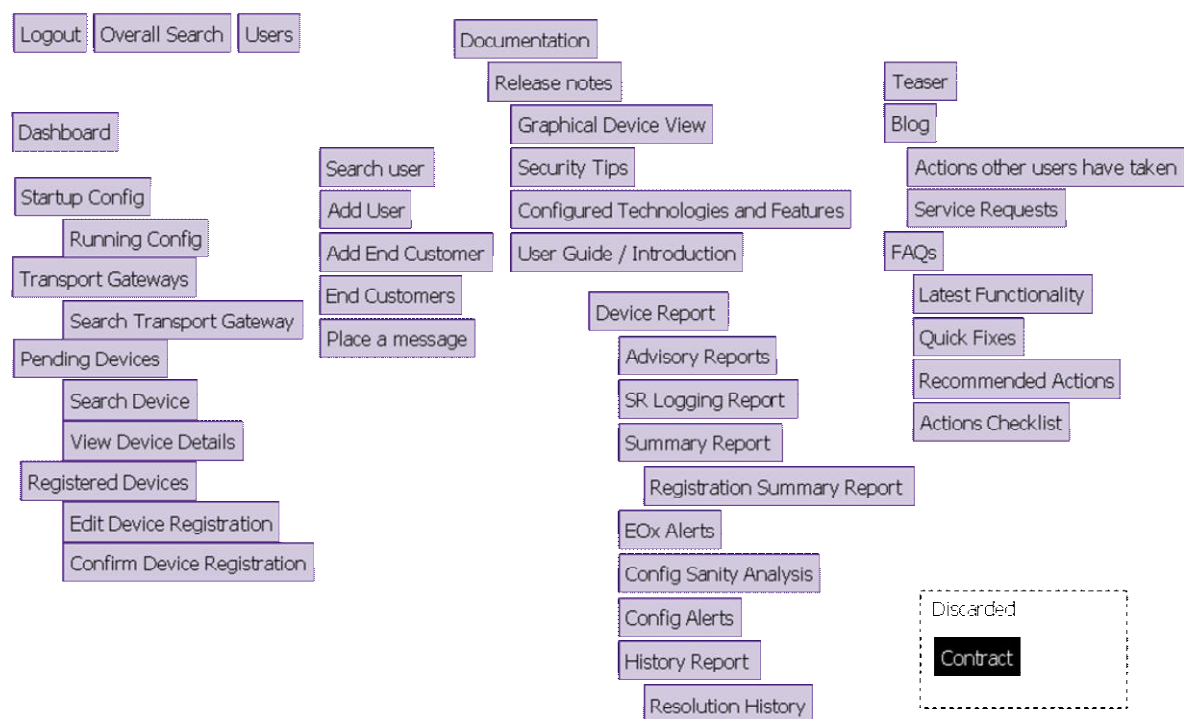
## Card Sorting CSe1

**ID:** CSe1  
**Interviewer:** Nadja  
**Company / Market:** Engineering  
**Role:** End Customer Network Engineer  
**Current User:** no  
**Method:** face-to-face



## Card Sorting CSf1

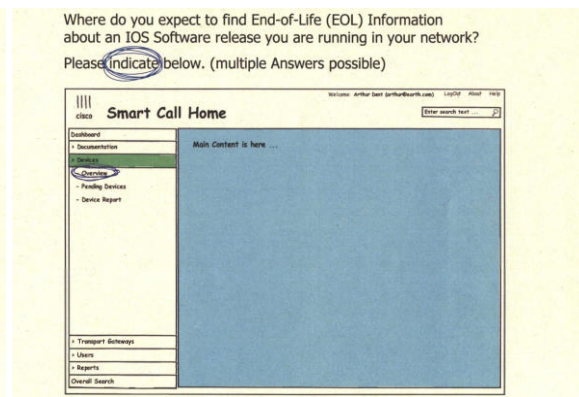
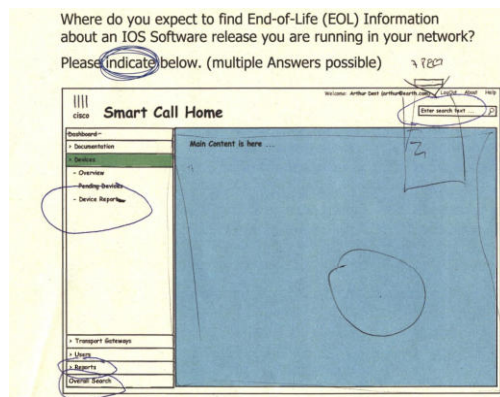
**ID:** CSf1  
**Interviewer:** Nadja  
**Company / Market:** Industrial  
**Role:** End Customer Network Engineer and Operator  
**Current User:** no  
**Method:** face-to-face



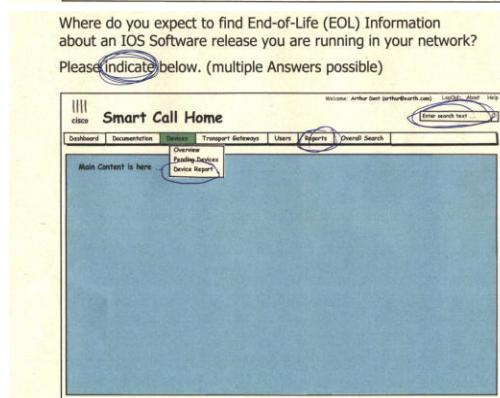
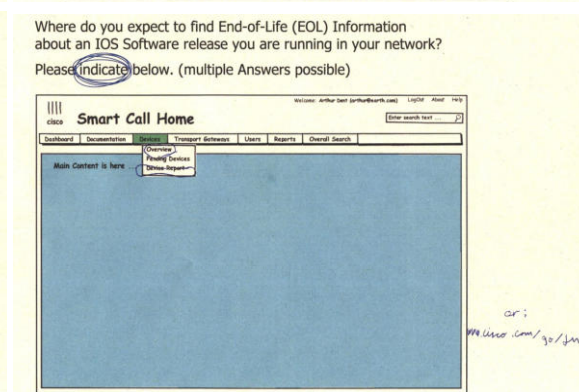
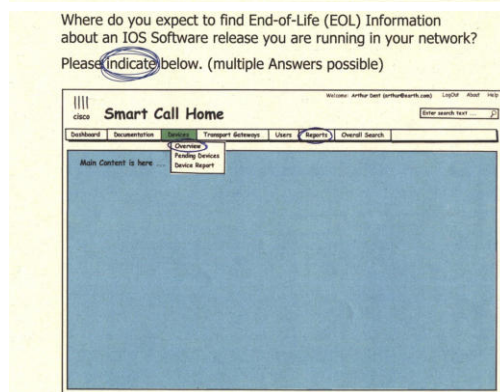
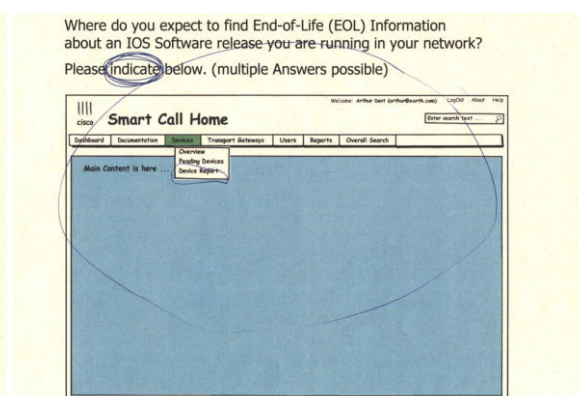
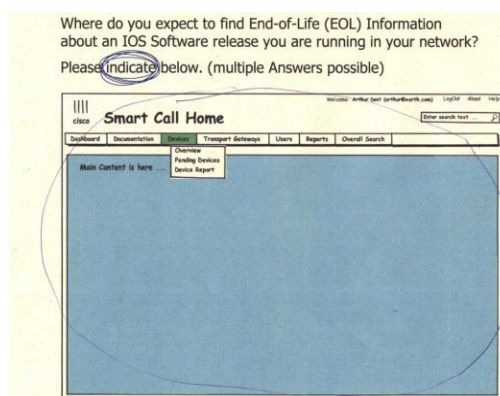
Question 4.3.2.1 a

Question 4.3.2.1 b

144



## Question 4.3.2.1 c



### Question 4.3.2.3

For an Overall Search in Smart Call Home, how do you prefer to view the search results?  
Please indicate below.

### I prefer this

Overall Search

7 Results Found

| Item #   | Serial Number | Product ID | Description                |
|----------|---------------|------------|----------------------------|
| 100-0001 | 0123456789    | NVC-0700   | Neveo 7000 10 Slot Chassis |
| 100-0002 | 0123456789    | NVC-0700   | Neveo 7000 10 Slot Chassis |
| 100-0003 | 0123456789    | NVC-0700   | Neveo 7000 10 Slot Chassis |
| 100-0004 | 0123456789    | NVC-0700   | Neveo 7000 10 Slot Chassis |

### I prefer this

Overall Search

403 Items Found

Showing 1-25 of 403 items

| Type    | Name      | Description                |
|---------|-----------|----------------------------|
| Linker  | Top Admin | 100-0001 Chassis           |
| Device  | 100-0001  | Neveo 7000 10 Slot Chassis |
| Device  | 100-0002  | Neveo 7000 10 Slot Chassis |
| Device  | 100-0003  | Neveo 7000 10 Slot Chassis |
| Device  | 100-0004  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0005  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0006  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0007  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0008  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0009  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0010  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0011  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0012  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0013  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0014  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0015  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0016  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0017  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0018  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0019  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0020  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0021  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0022  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0023  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0024  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0025  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0026  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0027  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0028  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0029  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0030  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0031  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0032  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0033  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0034  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0035  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0036  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0037  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0038  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0039  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0040  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0041  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0042  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0043  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0044  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0045  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0046  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0047  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0048  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0049  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0050  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0051  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0052  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0053  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0054  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0055  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0056  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0057  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0058  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0059  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0060  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0061  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0062  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0063  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0064  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0065  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0066  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0067  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0068  | Neveo 7000 10 Slot Chassis |
| Manager | 100-0069  | Neveo 7000 10 Slot Chassis |

For an Overall Search in Smart Call Home, how do you prefer to view the search results?  
Please indicate below.

### I prefer this

Overall Search

Find Advanced Search Options

Search for:

7 Diction Search

| Index   | Serial Number | Product ID | Description             |
|---------|---------------|------------|-------------------------|
| 44-0001 | 01210646A     | NW-0700    | News 7000 10 30 AM DASH |
| 44-0002 | 01210646A     | NW-0700    | News 7000 10 30 AM DASH |
| 44-0003 | 01210646A     | NW-0700    | News 7000 10 30 AM DASH |
| 44-0004 | 01210646A     | NW-0700    | News 7000 10 30 AM DASH |
| 44-0005 | 01210646A     | NW-0700    | News 7000 10 30 AM DASH |
| 44-0006 | 01210646A     | NW-0700    | News 7000 10 30 AM DASH |
| 44-0007 | 01210646A     | NW-0700    | News 7000 10 30 AM DASH |

44-0008 01210646A NW-0700 News 7000 10 30 AM DASH

### I prefer this

Overall Search

Find Advanced Search Options

Search for:

443 Diction Search

Showing 1 of 1 of 1000 10 30 AM DASH

| Type | Name | Description                     |
|------|------|---------------------------------|
| Live | 700  | 44-0001 News 7000 10 30 AM DASH |
| Live | 700  | 44-0002 News 7000 10 30 AM DASH |
| Live | 700  | 44-0003 News 7000 10 30 AM DASH |
| Live | 700  | 44-0004 News 7000 10 30 AM DASH |
| Live | 700  | 44-0005 News 7000 10 30 AM DASH |
| Live | 700  | 44-0006 News 7000 10 30 AM DASH |
| Live | 700  | 44-0007 News 7000 10 30 AM DASH |
| Live | 700  | 44-0008 News 7000 10 30 AM DASH |

For an Overall Search in Smart Call Home, how do you prefer to view the search results?  
Please indicate below.

### I prefer this

Overall Search

[Advanced Search Options](#)

Search for:

☐ Tables
 ☐ Messages
 ☐ References
 ☐ Alerts

| Message # | Serial Number | Index ID | Description               |
|-----------|---------------|----------|---------------------------|
| 404-0001  | 012401646     | NRV-C700 | Newcom 7000 10 Sat Oceans |
| 404-0002  | 012401646A    | NRV-C700 | Newcom 7000 10 Sat Oceans |
| 404-0003  | 012401646B    | NRV-C700 | Newcom 7000 10 Sat Oceans |
| 404-0004  | 012401646C    | NRV-C700 | Newcom 7000 10 Sat Oceans |

### I prefer this

Overall Search

[Advanced Search Options](#)

Search for:

☐ Tables
 ☐ Messages
 ☐ References
 ☐ Alerts

| Type    | Name          | Description                                     |
|---------|---------------|-------------------------------------------------|
| User    | tbl_zdrms     | NRV-old Data System                             |
| Table   | tbl-dt01      | NRV-C700 (012401646) Newcom 7000 10 Sat Oceans  |
| Table   | tbl-dt02      | NRV-C700 (012401646A) Newcom 7000 10 Sat Oceans |
| Table   | tbl-dt03      | NRV-C700 (012401646B) Newcom 7000 10 Sat Oceans |
| Message | tbl-dt01      | Description: 09-24-10 09:00 AM                  |
| Message | tbl-dt02      | Description: 09-24-10 09:00 AM                  |
| Message | tbl-dt03      | Description: 09-24-10 09:00 AM                  |
| Table   | tbl-cph       | NRV-C700 (012401646) Newcom 7000 10 Sat Oceans  |
| User    | Peter Stewart | person uid 1461014, Name: Stewart               |
| Message | tbl-cph       | NRV-C700 (012401646) Newcom 7000 10 Sat Oceans  |
| Message | tbl-cph       | Configuration: 09-24-10 11:00 AM                |
| Message | tbl-cph       | Configuration: 09-24-10 11:00 AM                |

For an Overall Search in Smart Call Home, how do you prefer to view the search results?  
Please indicate below.

[illegible]

For an Overall Search in Smart Call Home, how do you prefer to view the search results?  
Please indicate below.

### I prefer this

### I prefer this

For an Overall Search in Smart Call Home, how do you prefer to view the search results?  
Please indicate below.

[illegible]

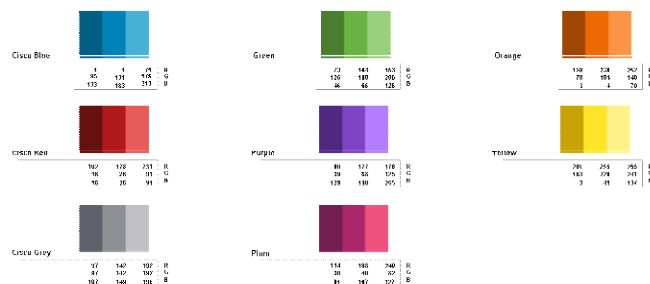
# Doc Style Guide

## Doc Heading 2

## Doc Heading 3

### Colors

#### Cisco Color Palette



Odd Table Rows 10% (Header = Light Chapter Color)

Even Table Rows 20%

Chapter one 114 30 81 and 240 80 127

Light Color Background

Dark Color Background 75% white = 220 199 211

Chapter two 1 95 133 and 71 176 213

Light Color Background

Dark Color Background 75% white = 191 215 224

Chapter three 102 16 16 and 231 91 91

Light Color Background

Dark Color Background 75% white = 217 195 195

Chapter four 80 39 129 and 178 125 255

Light Color Background

Dark Color Background 75% white = 211 201 223

Chapter five 73 126 46 and 153 208 126

Light Color Background

Dark Color Background 75% white = 209 223 203

Chapter six 159 70 3 and 252 148 70

Light Color Background

Dark Color Background 75% white = 231 209 192

Chapter seven 201 163 3 and 255 241 137

Light Color Background

Dark Color Background 75% white = 241 232 192

Caption of Figures and Tables: 9.5 (Normal)