1 Executive Summary

1.1 Background

SAP is a global leader in the delivery and support of enterprise resource management software, seeking to improve the way businesses, big and small, run their day-to-day activities in order to increase efficiency, and ultimately, profitability. Given the far reaching scope and massive scale of their typical customers, their software is understandably complex and difficult to use for novices. This has lead to the development of SAPs AGS, or Active Global Support network, which provides 24/7 support to SAP customers regardless of time zone. SAP seeks to grow their user base to 1 billion end users by 2015, and thus their support network will have to evolve to meet rising demand. The challenge posed to this years ME310 team is to look into this evolution and better define what key changes need to happen in order for SAP to support 1 billion users. A team consisting of three students from Stanford University in Stanford, CA, USA and four students from Trinity College in Dublin, Ireland has come together to work toward a solution to this very big challenge. The team has a very diverse background and is well suited to this challenge.

1.2 Progress

Before this quarter began, we met with our Trinity counterparts and SAP sponsors to discuss and receive much needed clarification and direction on the end goal of this project. From this meeting, we redefined our vision to focus on enhancing the support experience for low touch customers, those who receive support primarily through remote means as opposed to onsite support. This direction was chosen because the current system lacks empathy for the customer, and as SAP expands its user base, the only way to scalably provide support to them will be remotely. With this new vision in mind we decided to focus on instilling empathy to the support process through two key areas, self-service and remote support.

Empathy is a powerful feeling and allows people to connect and effectively communicate to each other. Technology tends to break that connection, separating people by screens and impersonal communication like email messages. To bring empathy into the support process, we experimented with the idea of sharing customer and support emotions through the ticketing system. We quickly learned however, that while empathy is important, it is not necessarily understanding emotion that will increase the efficiency of support. This led us to investigate ways to design environments where empathy could occur, in the direction of eliminating frustrative barriers like miscommunication and long response times present in the current ticketing system.

With this in mind, we developed different communication vehicles that incorporated a video call system in combination with remote screen sharing. Our initial prototype was a Support Kiosk, where a user could collaborate with a support consultant using a face-to-face telepresence system. While this improved communication and created a more engaging support experience, the distance to travel to the Kiosk was a concern, since it would be in
a fixed location in the customers office. We then developed a prototype called the Robox that was essentially a portable version of the Kiosk that could sit at the customers desk. While users enjoyed it, it did not quite create the environment and functionality we had with the Kiosk.

Before moving forward, we reexamined the nature of onsite support scenarios. We realized that when people perform support co-located, they sit next to each other, focused on the problem on the computer screen. This configuration was opposite to the configuration most telepresence and video chat systems have. We thought a side-by-side configuration put two individuals on the same level in more of a shared partnership, better simulating real-life support scenarios. This led us to our final vision of a side-by-side support system where the user faces forward and the video of the support consultant appears on a screen to the side. The profile of consultants face as if they were sitting next to the user. Both individuals could focus on the problem in front of them through a remote desktop, and could turn to speak and look at the other person if needed.

Simultaneously, we learned that SAPs support website was quite complicated, where different databases of solutions databases existed with search systems that were difficult to use because keywords were not intuitive. We knew that most submitted tickets already had answers, but it was just difficult for customers to find them. To this end, the Trinity team focused on a method for customers to easily identify their problem and search for the information they needed. The team developed an initial prototype using Python where users could input keywords and interact with them, along with suggested keywords. In this way, users could define their issue and find the answer using their own words.

1.3 Future Plans

Going forward, Robyn will be traveling to Dublin to further integrate Trinitys self-service system and Stanfords remote support system. Both teams are going to develop their prototypes further and integrate them into one cohesive product - SAP ENGAGE, the ultimate resource in technical support.
Figure 1.1: SAP ENGAGE
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Glossary

**ActiveEmbedded** The second highest level of support.

**AGS** Active Global Support - SAP’s internal customer support network.

**B2B** Business-to-Business - Commerce transactions between two businesses.

**B2C** Business-to-Consumer - Commerce transactions between a business and a consumer.

**Benchmarking** Looking at past and present solutions to similar problems to help generate ideas and inspiration.

**BI** Business Intelligence - a set of theories and methodologies that transform raw data into useful information for business purposes.

**Brainstorming** A group activity where all members think of new ideas related to a problem.

**CFP** Critical Function Prototype - a prototype that demonstrates a function that is viewed as key to project progress.

**CEP** Critical Experience Prototype - a prototype that is designed to give a test and evaluate a users “experience” using a product.

**CRM** Customer Relationship Management - a model for businesses to manage interactions with current and future customers.

**DHP** Dark Horse Prototype - a prototype that focuses on testing an idea seems infeasible. Meant to explore the edges of the design space.

**Development Engineer** SAP’s term for a software engineer.

**Enterprise** Referring the SLA level of support. Most standard form of support.

**Escalation** The “SWAT” team of AGS. Members are highly trained and are flown out to on-site locations where customers have issues with highest priorities.

**ERP** Enterprise Resource Planning - software designed to help large corporations run their day to day operations.

**FTS** Follow the Sun - support procedure that involves transferring issues from one location to another in different time zones to provide 24/7 support.

**Functional Prototype** A prototype that focuses on construction of materials, engineering, and testing of an integrated functional system that makes progress towards the vision for Spring.

**Funky Prototype** A prototype that to focus on certain technical issues that have not yet been considered or resolved by exploring a design’s proposed functionality.

**High Touch Customer** A customer who receives more dedicated support like on-site support. Generally customers with ActiveEmbedded or MaxAttention SLAs.
HR  Human Resources - a set of individuals who make up the workforce of an organization.

KBA  Knowledge Base Articles - Provide a solution for an incident specific and explanation about system behavior, how to work a tool and how to set some specific customization to reach the desired behavior. A KBA is a new alternative to help customers find relevant information and to solve his doubts [2].

Kivy  An online platform to create user interfaces using Python.

Low Touch Customer  A customer who receives less dedicated support, through more common protocols such as the ticketing system and phone calls. Generally customers with Enterprise SLAs.

MaxAttention  The highest level of support.

Onsite Support  Refers to the type of support where users resolve their problems with the help of support consultants situated at the customer’s office.

Ping-pong Effect  A situation where a support ticket is bounced around to different people until it finds the right person to solve the issue or is bounced back and forth between the customer and support consultant.

Remote Support  Refers to the type of support where users resolve their problems by communicating with support remotely, either through email, phone, or video.

Self-Service Support  Refers to the type of support where users can resolve their problems by searching existing solution databases.

SLA  Service Level Agreement - contract between SAP and their customer that outlines the level of support that SAP will deliver.

Support Consultant  The main point of contact between SAP and the customer when there is a product issue. Support consultants receive ticket messages and resolve them in the most timely manner to maintain customer satisfaction.

Ticket  An electronic message that documents a customer’s issue sent to AGS.

Ticket Processor  Another term for a support consultant, primarily one who deals with the resolution of tickets entering the ticket queue.

TQM  Technical Quality Manager - SAP personnel who is on-site at the clients location for those customers with a “MaxAttention” SLA.
2 Context

2.1 Need Statement

SAP is one of the world’s largest business software companies. Numerous Fortune 500 companies use SAP’s software to run their businesses, and approximately 65% of the globe’s GDP passes through an SAP system each year. Continually pushing the boundaries of innovation and growth, SAP now sets its goal to serve 1 billion users by 2015. How can a company successfully serve 1 billion users? It would not only require robust and usable products, but also challenge the company’s capability to provide services and support to this many users. As an enterprise software company, SAP’s products focus on features that are complex and highly customizable based on their customer’s unique needs. Thus, reaching the goal of 1 billion will be a difficult path, not only in terms of the quality of their software products, but also in terms of how SAP can offer high quality and responsive support critical to satisfying their customers’ needs and enabling them to run their businesses smoothly.

SAP’s Active Global Support, or AGS, department currently has about 2,200 support consultants offering support to more than 20,000 customers in over 120 different countries. Those consultants are currently facing 1 million issues per year. As the number of users increases, the current support system must be evolved to handle an increasing amount of support needs and provide their customers a more satisfactory experience. AGS needs to undergo transformations and improvements to adequately serve the large number of customers seeking support. Without a more scalable and efficient support system, SAP will not be able to realize their goal of serving almost one-seventh of the world’s population.

2.2 Problem Statement

The Design Challenge is to define how SAP’s service and support should evolve to serve 1 billion users - in other words, an ever increasing number of users. As the number of users increases, it will be nearly impossible for AGS to expand proportionally to fit the support needs of its users. The AGS department must transform their model in a much more scalable way. Customers can be categorized as high touch or low touch. High touch customers, typically those with a MaxAttention SLA, receive onsite consultants who provide efficient and fast-response support. Low touch customers, typically those with an Enterprise SLA, do not receive this dedicated support service and receive support remotely through online resources and the ticketing system. Most of these customers are smaller business who will be the majority of SAP’s increasing user base, and will not be able to afford onsite support. Therefore, the team’s goal is to enhance the support experience for those customers by improving two key areas:

- Self-Service Support: This is going to be a key factor in significantly reducing the number of tickets received by AGS. Most tickets in the system are either already solved or simple “how” to and “why” problems. If an effective self-service system is provided to customers, they could solve a majority of issues by themselves without having to
submit a ticket. Currently, customers have to navigate through a multi-branched, complicated website, reaching different searchable databases that are helpful only if they understand the problem as defined by SAP. Our question then is, how can we provide a self-service support system where customers can easily identify their problem and access the information they need?

- **Remote Support:** If customers cannot solve their problem themselves, they must seek help from AGS directly. We know that the most efficient form of support is having a consultant onsite, which can effectively reduce average resolution times from 3 weeks to 3 days. However, this is not a scalable delivery of support. AGS will have to provide support remotely beyond the ticketing system to accommodate for a larger number of users.

Customer support is well-known for its frustrations and inefficiencies. To relieve this familiar viewpoint, the team will emphasize an important factor within each type of support to increase empathy within the process. Customers and support consultants both need to understand each other better to solve the problem together and have an enjoyable support experience.

### 2.3 Corporate Partner: SAP

SAP is the world leader in enterprise applications in terms of software and software-related service revenue. Based on market capitalization, they are the world’s third largest independent software manufacturer with more than 251,000 customers in 188 countries, more than 66,000 employees, an annual revenue of €16.22 billion, and locations in more than 130 countries [3]. They have a history of innovation and growth as a true industry leader. SAP’s 41-year history of success is defined by a few key themes:

- A belief that real-time data processing can help bring people closer to business intelligence.
- A dedication to innovation and an entrepreneurial spirit that enables SAP to continually push what is technically possible.
- An early commitment to collaboration and co-creating solutions with their customers.
- SAP is also a champion of Design Thinking, and SAP’s co-founder, Professor Hasso Plattner, has challenged the company to place design at the heart of everything they do.

### 2.3.1 Corporate Liaisons

#### 2.3.1.1 Katharina Rock

Katharina began her career in Germany as an implementation consultant working for an SAP Partner company, where she worked extensively on HR-related software products. Some time after, she moved to SAP in Toronto and eventually settled at SAP Labs in Palo Alto. She held multiple positions ranging from the development or engineering teams to quality assurance or engineering services. She currently works within Solution Validation where new products are thoroughly tested to ensure functionality.
2.3.1.2 Tony O’Donnell

Dr. Tony O’Donnell is a Chartered Engineer and experienced software development manager in the analytics space. He holds a PhD in Computer Science and a bachelor’s degree in Engineering from Trinity College Dublin.

His current role is within SAP’s Business Intelligence organization where his team works on the Design Studio application. He has previously managed teams and projects in the applied research and innovation department of SAP, again with a focus on data integration and analytics.

Tony is also part of SAP’s senior leadership team for Ireland - one of the company’s top 10 largest operations with 1,400 staff. He represents the company externally on a number of industry panels, and has also appeared before the Irish parliament on SAP’s behalf. In addition to strong technical knowledge on BI, semantics, data integration, graph theory and cloud computing, Dr. O’Donnell also has a particular interest in IP, patents and tax.
Outside of his day to day work, Tony is also involved in the community and voluntary sector. He sits as a member of Kildare County Council representing the 50,000 residents of the Kildare Electoral Area. Tony is also a director of his local LEADER company, a Rural Development Program part-funded by the European Union.

Dr. O’Donnell is also an active member of the Engineers Ireland Computing Division, serving as vice-chair for 2013-2014 and in 2013 was invited to join the Advisory Board for Trinity’s School of Engineering.

2.4 The Design Team

Team SAP consists of four students from Stanford University in Stanford, CA, USA and four students from Trinity College in Dublin, Ireland. We bring a diverse skill set from varied backgrounds and are ready to tackle SAP’s design challenge.

Vinh Bui  
Status: Stanford Mechanical Engineering Masters Candidate  
Contact: vbui22@stanford.edu  
Skills: Basic mechatronics and machining (mill, lathe). Sheet metal forming and laserCAMM Computing: SolidWorks, MATLAB, Python, C++

Born and raised in Northern California, the Silicon Valley culture of innovation has influenced me a lot, leading me to an interest in engineering, particularly in the automotive field. I came to Stanford in 2008 for my undergraduate degree, majoring in Mechanical Engineering with a minor in Management Science and Engineering. I have worked at Akebono Brake in manufacturing design and NovaTorque in electric motor development and testing. I also enjoy hip-hop dance, swimming, gloving, and electronic dance music.
Kevin Burke  
Status: Trinity Manufacturing Engineering and Management Degree Candidate  
Contact: burkek4@tcd.ie  
Skills: CAD, Prototyping, Design Thinking, MATLAB, Microsoft Excel

I’m a 4th year Engineering with Management student at Trinity College, Dublin. My interest in pursuing an engineering degree stems from a strength and passion for mathematics at secondary level education. I was advised to choose an engineering degree based on the practical applications of mathematics and physics within the field. Although this has constituted a lot of the course, the wide range of topics within the course is challenging, but the vast areas of study is both interesting and highly engaging.

One of the most enjoyable parts of this course is the group dynamics that emerge from the large amount of group/team orientated work that we undertake. The class, for the past three years, has been comprised of seven very unique and independent guys. This year, we have been joined by five Brazilian students on the Science Without Borders program. Because of the close confines of the class, we’ve all worked with each other at some point. Because of this, I wish to pursue a career where I will work in a group, be in close contact with people and that offers creative and innovative input.

Outside of academics, my main passion is golf. I love both the science of the game, but also the art. There is a huge engineering input in the modern game, from the precise mechanics of every part of the body during the swing, to the extensive and complex chemical engineering that goes into the manufacture and design of golf balls, and the evolution of carbon-fibres, steels and titanium for clubs.

Yongbin Han  
Status: Stanford Mechanical Engineering Masters Candidate  
Contact: ybhan@stanford.edu  
Skills: Chinese Language, Computing: Python, C++

I am originally from Xi’an, China. I came to the United States four years ago and got my Bachelor’s degree in Mechanical Engineering with a minor in Management at the University of Minnesota. I graduated with Latin Honors and wrote a honors thesis on using CNT-PDMS Material as Force/Pressure Sensor. Now I am a first year ME
master student at Stanford University focusing on Design Methodology. I am interested in using the mechanical engineering knowledge to design new products or redesign the existing products in order to make them better.

Mike McHugh  
Status: Trinity Manufacturing Engineering and Management Degree Candidate  
Contact: mchughmp@tcd.ie  
Skills: Design, Prototyping, Metal and Woodworking, Project Management  
Computing: MATLAB, CREO, HTML + CSS

I am working towards a bachelor’s degree in manufacturing engineering and management from Trinity College, Dublin, Ireland in June 2014 and will then pursue my masters in the same discipline the following year. I have worked as an intern in Trinity under Professor Kevin Kelly for the past two summers in the Mechanical Engineering Department. My work involved helping to develop and run a Summer School to encourage secondary school girls to choose engineering when they enter college. It was very interesting and satisfying work. Within that Summer School we ran some classes based upon Design Thinking processes. Outside of the Summer School I did research on education, team dynamics, personality profiling, and some work on omnidirectional catadioptric optics for use in robotics, website development, and manufacturing processes. I would like to become more involved with empathic design; my passions are innovation, creativity and team-driven achievement and excellence. I am motivated by people or projects that try to bring about real and positive benefits to others. Outside of college I enjoy song-writing, and I have fantasised about being the lead singer/guitarist in a band with Bob Dylan on bass, Lou Reed on piano and Leonard Cohen on drums.

Robyn Nariyoshi  
Status: Stanford Mechanical Engineering Masters Candidate  
Contact: rnariyoshi@stanford.edu  
Skills: CAD (SolidWorks, AutoCAD 3D); Heat Transfer Analysis (Thermal Desktop, SINDA/FLUINT); media editing (Final Cut Pro); Sewing and Ironing.

Born and raised in Honolulu, HI, I moved to the beautiful land of California to attend college at University of the Pacific. At Pacific, I received my B.S. in Mechanical
Engineering as well as interned at NUMMI and Lockheed Martin. My interests in are human-centered product design and design methodology. I love the way things move and come together for a bigger purpose. Outside of engineering, I am a professional hip-hop dancer and choreographer.

Vinicius Serra  
Status: Trinity Undergraduate Integrated Engineering with Management  
Contact: serrav@tcd.ie  
Skills: Maintenance Management, Services Procurement, Fast Learner, Open-Minded  
Computing: Access, MySQL, Project, Visual Basic, Excel

I’m a Brazilian Production Engineering Undergraduate, and currently studying Integrated Engineering with Management at Trinity College Dublin, with a government scholarship for one year. I have been working for the past two years at a Brazilian company called Vale, the world’s biggest iron ore miner; I was an internship at Procurement dealing with acquisition of services and contracts management. There I attended three entirely different projects, where I gained much of the practical experience I have today, one improving efficiency/ reducing costs of Maintenance, other doing an Spend Assessment and the last one creating an application/database for Procurement Categories Management. Academically my knowledge is mostly oriented to management tools and business strategies. In my spare time I enjoy eating a lot, playing some video game and reading all kind of books.

Barbara Silva  
Status: Trinity Undergraduate Integrated Engineering with Management (1 year at TCD) + Manufacturing Engineering (5 years at UFS- Brazil)  
Contact: silvab@tcd.ie  
Skills: Teamwork, Adaptable, Creativity, Time Management  
Computing: MATLAB, MS Project, MS Excel Advanced

I’m a Brazilian undergraduate student studying at Trinity College Dublin for the current academic year. This opportunity is due to a scholarship provided by the Brazilian government as part of an initiative called Science Without Borders. In Brazil I’m in my final year in a Manufacturing Engineering course, which is a mix of engineering
modules and management. The modules I’ve chosen in my final year are aligned more
to business and management versus engineering as I have a great interest in innovation,
product design, project management and in the ways communication and staff relations
can enhance productivity.

I have past experience as an intern with Shower Industry in Brazil, where I worked
on the factory floor on quality control. Within this experience I had the opportunity
to work with different personalities and gain a clear sense of what really happens in
a manufacturing environment and in business. Much of the time I spent there I was
working towards implementing a Six Sigma standard within the quality control area;
the vision was to make the environment a better place for the operators to work by
providing the right tools in the right places, thereby enhancing productivity and quality
of their work and reducing operation time.

Outside of University I took a MS Project course and a Six Sigma course, both of
which were I found useful towards having a good comprehension of how to structure a
project, how to communicate, and how to allocate resources; two main focuses being
the decision-making process and time management.

In my free time I enjoy hanging out with friends, reading blogs, books and magazines
related or not to management and engineering. I love to run and work out, I find them
a great stress relief. Eating is a big passion, and an occasion to have a good chat with
friends. Finally I really like to travel, to get to know new people and to learn about
new cultures.
2.4.1 Coach

2.4.1.1 Vinod Baya

Vinod Baya is the Director of the Center of Technology and Innovation at PricewaterhouseCooper, a company that specializes in assurance, tax and advisory services. He is a ME310 alumni and holds a doctorate from Stanford. Having been a technology strategist and futurist for over 15 years at PwC, he has been valuable coach in the 310 curriculum.

Figure 2.3: Vinod Baya, Team Coach.
3 Design Requirements

Introduction

SAP ENGAGE is a centralized location for technical support that must enhance the customer’s support experience to be more efficient. Our design will focus on two key areas of support:

- Self-serve support
- Remote support

The requirements listed below address the functionality of the design within each key area. The main functional requirements of ENGAGE are to provide an easy-to-use interface for self-searching SAP databases, and to provide a simple access point for video conferencing with a support consultant in a realistic setting. The self-search requirements are further defined in Table 3.1 and the video conferencing requirements in Table 3.2.

3.1 Functional Requirements

3.1.1 Functional Constraints

Self-Service Support:

- Must be a python language software with an integration to Kivy in order to display the User Interface.
- Must be human-powered: the system needs to receive user input in order to start the search.
- A database has to be built in order for the system to function.
- Words that are not related to the proposed scenario are not going to be weighted or take into consideration.
- It needs hardware to display the user interface.

Remote Support:

- Must be simple to use by consumer product standards.

3.1.2 Functional Opportunities

Self-Service Support:

- The system can operate on another code language.
- The test scenario can be changed.
- The language can be changed.
- Database can be built on the existing code.
- Data can be removed.
### CHAPTER 3. DESIGN REQUIREMENTS

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Metrics</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Save words</td>
<td>Percentage of words input by the user present on system database</td>
<td>Must save all words and not repeat</td>
</tr>
<tr>
<td>Conjunctions and pronouns</td>
<td>Clear User Interface with only relevant words.</td>
<td>Remove all conjunctions and pronouns.</td>
</tr>
<tr>
<td>Related words (synonyms)</td>
<td>High match between words</td>
<td>Relate words according to number of connections between them.</td>
</tr>
<tr>
<td>Solutions links</td>
<td>High number of words on the links provided that are on the word cloud.</td>
<td>Wordcloud analysis to find solutions that have words present on the wordcloud on its content.</td>
</tr>
<tr>
<td>Weighting of words according to algorithmically methods.</td>
<td>The difference percentual between system and user weighting should be close to 0.</td>
<td>System weighting should be as similar as possible to user weighting.</td>
</tr>
<tr>
<td>Users weighting of words according to commands.</td>
<td>The system should be highly responsive, change word size in less than 1 second.</td>
<td>According to user command the system has to resize words, it depends not only on the software but also on the touchscreen quality in case one is used instead of a mouse.</td>
</tr>
</tbody>
</table>

Table 3.1: *Functional Requirements for Self-Service Support*

- Commands can be changed according to feedback from users.

Remote Support:
- May display projections instead of using screens.

#### 3.1.3 Functional Assumptions

**Self-Service Support:**
- All words displayed on the screen are relevant.
- User already has an idea of what he is searching.
- If the user does not find the answer a number of interactions can be made.
- The user input is in English.
- Data base is in English.
- The user is familiar to the test scenario.

Remote Support:
- The company has enough internet bandwidth to support the connection requirements
- User will have a context API installed in their SAP applications so support may easily access user history.
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Metrics</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide and relay clear video feed of support consultant and customer.</td>
<td>Minimum download/upload speed to support a high quality video call 400kbps/400kbps.</td>
<td>To ensure clear communication, we must have an adequate connection to avoid lags, cutting in and out, and anything else that may contribute to miscommunication.</td>
</tr>
<tr>
<td>Provide and relay clear audio feed of support consultant and customer.</td>
<td>Users verified they could hear consultant.</td>
<td>Users must be able to hear and understand support consultant in a clear uninterrupted manner.</td>
</tr>
<tr>
<td>Easy access touch or key pad.</td>
<td>Simple web code allowed access to support consultant.</td>
<td>Simplifying the video conferencing process will make it key to encourage users to continually use product.</td>
</tr>
<tr>
<td>User must be able to comfortably see support in their peripheral vision.</td>
<td>Must be within a 120 degree field of vision from customers line of sight.</td>
<td>Customers did not like turning their head too much to see support consultant. Comfortable viewing in their peripheral vision will also allow customer to receive visual cues from support consultant.</td>
</tr>
<tr>
<td>Chair must provide comfortable support for at least an hour.</td>
<td>Chair had adjustable height and was able to move around freely.</td>
<td>Customers being in a comfortable environment allows for better focus.</td>
</tr>
<tr>
<td>System must provide user freedom to move freely.</td>
<td>Chair had freedom to turn and move back and forth.</td>
<td>The user will be able to comfortably gesture and talk to support in a natural manner. They are also able to turn and focus solely on support if a more direct conversation is required.</td>
</tr>
</tbody>
</table>

Table 3.2: Functional Requirements for Remote Support

- Users will be provided with a ticket number to initiate video call appointment.
- There will be a power source in the office space.

### 3.2 Physical Requirements

Self-Service Support: The interface needs to run on a system capable of hosting a large database and run python, in addition to a touchscreen, keyboard and mouse. Below is a breakdown of functional and physical requirements defined by the search system process.

Remote Support: The main physical requirements concern the size, weight, and ergonomics of the design. It must be:
CHAPTER 3. DESIGN REQUIREMENTS

3.2.1 Physical Constraints

Self-Service Support:

- Aesthetically pleasing.
- Ergonomic.
- Must be able to fit into an office space.
- Must be safe. No unsafe edges or expose and dangerous electrical components.
 CHAPTER 3. DESIGN REQUIREMENTS 

• The touchscreen has to be highly responsive with good touch recognition.
• The system must be agile to quick make interactions.

Remote Support:
• System cost should not exceed $4000 budget for all components.
• Must meet maximum allowable weight load inside given office building.
• Must accommodate users various heights and sizes.
• Touch screen must be within an average arms length from the chair.

3.2.2 Physical Opportunities

Self-Service Support:
• Use of Kinect to enhance interactivity.
• Use of voice control to control the system.
• Use of an overhead projector to display the UI on a bigger surface.

Remote Support:
• May be collapsible. (System can open up to full size)
• May be portable. (System goes to user)

3.2.3 Physical Assumptions

Self-Service Support:
• The touchscreen is highly responsive.
• User is familiar to touchscreen technology.
• User is familiar to resizing words with the mouse.

Remote Support:
• This system will be implemented in an indoor environment.

3.3 Business Requirements

• Must adapt to most customer office environments.
• Must not pose a disturbance to customer work flow.
• Provided services must be defined within SAP’s contractual service agreements with customer.
• Information must be passed through the system securely.
• Must maintain the integrity of SAP as well as the customer.
4 Design Development

4.1 Benchmarking

In Fall Quarter, the team benchmarked different types of support, summarized below:

- Phone support is one of the oldest methods of remote support for large customer bases. Users call in to large support centers wherein they verbally describe their problem to a service representative. This is fairly easy to implement as phones are easily accessible by most customers, but is largely not scalable to extremely large user bases and can be both inefficient and frustrating to both customers and service representatives.

- Message-based support has become increasingly more common in today’s web based society and can be implemented through email, chat, or some other messaging client. Users type a written description of their problem and send it off to a service representative. The service representative then researches the problem and responds to the customer with a solution. There is zero idle waiting time for either party, as they respond at their convenience, but can increase response times and leave the customer with a sense of ambiguity as to the state of their situation.

- Many companies now implement in-person support through storefronts or mobile service technicians. In-person support is very effective because it allows users to clearly describe the problem and for support representatives to easily understand the problem, as all forms of human communication are available (verbal, gestures, body language). Users can also “show” the problem to the service representative in many cases, which makes developing a full understanding of the situation much easier.

- More recently, many companies have been turning to online support via user forums and searchable databases. This is really an interactive extension of a more traditional user manual, as it provides explanations of key functions and solutions to the most common problems. Forums create a community that allows others in a similar situation to work together to understand and solve problems.

Equipped with this information, the team moved towards technologies that could enable remote support. Specifically, the team researched different telepresence technologies and remote collaboration tools to understand what existed and what elements could be incorporated into our development.

In early January, the team had a video conference between SAP Dublin and SAP Palo Alto using the Cisco TelePresence system. The video screens were set as if the remote individuals were sitting across the meeting table, creating a relatively real experience. The system used high definition screens and a dedicated conference room for audio quality control. However, we noticed that eye contact was off when looking directly at each other.
TelePresence Tech, a company in Texas, provides 3D telepresence systems that account for eye contact. Instead of being mounted above the screen as in most systems, the camera is mounted behind a beamsplitter screen at eye level, producing a much more “real presence.

We also looked into remote desktop software as collaboration tools. Team Viewer allows remote parties to connect, view, and control each other’s screens. It also allows multiple users to be able to view a single screen and users can adjust control preferences. Syncpad is a remote whiteboard application which allows users to draw on a white screen and share...
with participants in real-time. In essence, it simulates working on a white board together.

Using a 2008 study done at the University of Cambridge, the team also looked into remote technologies comparing collaboration between co-located individuals and remote individuals, and different technologies to bring co-located elements remotely [5]. A summary of the major findings is listed below:

Spatial Partitioning: Personal vs. Group Territory

- In physical meeting spaces, participants usually have their own personal space to write their own notes, use their laptop, etc.
- There is also a common space where participants can share their notes or work together on something, and this is usually located in the center of the table.

Gestures:

- Point: Indicates focus on a particular thing.
- Spatial: Indicates size, distance, or relative location.
- Kinetic: Indicates action.
- Other: Indicates things such as emphasis, call to attention, etc.

Workspace Awareness:

- Consequential Communication: Describes the movement of an individuals body as a consequence of their actions in the workspace. These cues are perceived as participants watch each other work, either peripherally or intentionally.
- Feedthrough: Describes the visual and auditory cues arising from manipulation of a task artifact.
- Intentional Communication: Conversation and gesture.

As gestures are an important component of communication, the study looked into using remote technologies to portray them. Using a camera mounted looking down and a projector, an overdisplay of the remote persons arm appeared in the projection. In this way, the participants on each end could see the shadow of the other persons arm as if they were
working on the same table. The ability to do this remotely increased the effectiveness of communication. We will be utilizing these characteristics in our final design.

Figure 4.4: Arm over-display

4.2 Needfinding

The team interviewed a number of people during the quarter to better understand the process of SAP support from the ticketing process to onsite support. We were able to define different problem areas within the support system and receive customer perspectives into how things could be improved.

4.2.1 Mike Murray, Customer Experience at SAP

Mike is part of the Customer Experience team, which analyzes information and data from customers and utilize their findings to improve the support process by doing such things as developing a list of best practices for ticket processing managers to distribute to their teams. He gave us a breakdown of the ticket solving process as described in Figure 4.5.

From our earlier interviews, we found that the number one customer complaint was that it took too long for problems to be resolved. Therefore, we inquired him about the major causes to long resolution times. He stated there were five main reasons:

1. Missing details and customer system information requires additional messaging.
2. Lack of communication between the customer and the ticket processor (support consultant) means the ticket must be reviewed again after a break in communication, adding time.
3. Problems with connections prevent the processor from determining a root cause analysis, adding time.
4. Ping-ponging with the customer prevents the ticket from moving forward.
5. Phone calls are not made to quickly clarify misunderstandings or acquire needed information, often resulting in ping-ponging.

A ticket can even be ping-ponged within SAP, where it is rerouted until it finds the right processor to solve the problem. In these cases, it takes additional time for each person to
understand the problem. Factors that add to this time are how long it has already been in the process, how many processors have worked on the problem, and how well the previous processor summarized the problem. On average, tickets can be ping-ponged anywhere from 3 to 5 times, where tickets with 3 or less being the ones with the highest marks of satisfaction.

4.2.2 Ronald Grabyan, Southern California Edison (SCE)

Ronald is a Data Warehousing Manager at SCE, a utilities company in southern California. SCE is an Enterprise level customer using Business Warehouse (BW) on SAP’s HANA database. He gave us valuable insight into his experience as a low touch customer and what elements of the process could be improved. As with most customers, his first complaint was
Ronald Grabyan, Data Warehousing Manager at SCE

having to wait for days to receive a reply after submitting a ticket. Sometimes he received a phone call within an hour, but only if it was a serious “production down” problem. He also noted the issue of time transfer, when a problem reaches the queue at the end of a shift, in which it is transferred to the next available location in the world for processing, which increases processing time.

To self-solve their problems, SCE would look up solutions on the OSS Note system, which is a database of past tickets that have been solved. However, he emphasized that the search system was difficult to use because the language was very specific to SAP. He wanted “a better tool thats a lot more intuitive.” Overall he wants the whole process to be more friendly, efficient, and intuitive. He thinks there should be a better communication vehicle than just the ticket, and as a potential solution, he thinks video conferencing would be good because it can connect customer and support in a different way.

4.2.3 Klaus Krug, Warner Brothers (WB)

Klaus is a Project Manager at Warner Bros. He is apart of a project to replace WB’s legacy system for Intellectual Property Management (IPM) with SAP’s CRM-IPM system
on their HANA database. This would allow WB to run queries on IP data much faster than with their old system. Interestingly, WB used to have an Enterprise level SLA, but upgraded to MaxAttention, so Klaus was able to provide us with insight from both perspectives.

He stated that during implementation of the software, the normal support protocols were not working for what they needed with such a large implementation. Response times were too slow and WB needed more dedicated support as opposed to the more abstract commitment of support through the ticketing system. Once they switched to MaxAttention, problems that used generally took 3 weeks to get resolved took just 3 days. With an average of 10 people onsite, Klaus described 5 key elements that made support much more efficient:

- Deeper conversation into each problem.
- Additional topics could be brought up quickly.
- Support visibly saw the problem being fixed.
- Support could understand more of the context.
- Instant feedback from onsite support.

From his experience with both types of service, Klaus believed sharing an initial level setting was critical to improving the support process. To this end, emails can be very lengthy, so a more visual and real time method of communication would be the most beneficial. "Early human to human interaction would easily clarify information and orient support and customer effectively so that messages are not sent back and forth for weeks.

### 4.3 User Persona

From these needfinding interviews, we developed a clearer understanding of our potential user. As we are developing a solution for SAP’s customers, we had to define who within a given company would be interacting with AGS. It turns out that there is a range of users, from business users to more technically-minded IT users. Because SAP is looking for a solution that will scale to 1 billion, our design must encompass the majority of these users. Thus, we created a our persona, Somdev, to represent the business and IT users of SAP software.

![Somdev](image-url)
Somdev is an IT technician in his early 40’s who works with specific SAP software products. He has worked with different systems for the past 15 years, and is primarily responsible for integrating updates to new systems and maintaining existing ones. When faced with a problem, he usually searches through Google and occasionally the SAP support portal. When he cannot solve a problem himself, he communicates to support through ticket messages and phone, which frustrates him because it takes days to weeks to receive a reply. He uses chat, phone, and video conferencing to communicate with his coworkers on a regular basis, but exclusively communicates with AGS using messages. He wishes there could be a better communication vehicle to AGS so that he could get his work done more efficiently and not have to spend lots of time waiting on replies to progress in his work.
4.4 Trinity Dark Horse Prototype: Support Robot
Artificial Intelligence

The design space was explored by working towards the milestone prototypes. Each prototype allowed a certain level of free will; they permitted the team to not worry about certain infeasibilities of implementation and to focus solely on key functionalities and characteristics of what the team wanted to create.

The theme for our dark horse prototype was addressing the issues of user frustration and support empathy. From our need finding and CEP activities, we’ve identified frustration and empathy as the major communicative weaknesses in the current SAP support community. With this in mind, we set about mapping the journey through an automated support robot that caters to individual personalities, technical abilities, time constraints and preferred support engagement. The ideal result for the dark horse is a uniform content user platform, where information and solutions are delivered in a clear, concise and user-preferred manner.

Our support robot appears when the user encounters a problem and pushes a button to seek support. The robot first engages with the user by detecting their body language to identify their current mood. The robot functions by processing various inputs from the user and outputting an algorithm that distributes user-based solutions. The robot detects both visual and aural inputs from the user. Certain facial characteristics can be related to user personalities, understanding and attention levels. Gazing, leaning, eyebrow movements and smiling etc can be parameterised with vocal tone, speed of speech, response times and language proficiency to build a cognitive profile of each user. In time, a more sophisticated interaction between robot and human can exists, and the robot learns more about individual habits and abilities of each user.

Figure 4.9: Trinity Dark Horse Prototype

4.5 Trinity Funky Prototype: Word Cloud

As the team entered February, we had learned that users would feel less frustrated if they had help in defining their problem. Utilising the learnings from the dark horse prototype,
we built our funky prototype to give user and support a more intuitive interaction with the system. It allowed the user to state their problem simply, as keyword widgets are given display size depending on their priority to the problem. Users have the ability to pick and choose words that they feel are applicable to their problem, and swipe away things they feel are unrelated to the problem.

For example, you’re hungry and only have 15 minutes to spare; you check the fridge and you have three eggs, a full uncooked cloned chicken, a couple of dodgy peppers, a pack of rooster potatoes from Mammy, and your housemates tasty, tasty ham. Pressure cookers, kettles and grills won’t suffice for time restrictions, but a microwave or frying pan might be useful. The user may process their solution to something like the image below.

![Trinity Funky Prototype](image)

Figure 4.10: Trinity Funky Prototype

Eggs and ham are given preference, and hence size, due to their time convenience in preparation (and their tasty tastiness). Peppers are useful too, but are a bit dodgy, and so its visual size decreases. Chicken and potatoes are impractical due to their preparation time/hormone content, and therefore are very small visually and can be swiped away by the user. That leaves eggs, ham and peppers. Fancy an omelette?

The funky prototype echoes the perils of defining problem parameters for current SAP users. We used this prototype as a platform for designing the functional prototype, updating from Powerpoint text widgets to the Kivy system as defined in the next section.

### 4.6 Trinity Functional Prototype: Interactive Search

Currently, SAP runs a ticketing system for their users when they encounter a problem and seek support. These tickets are given different levels of priority, depending on the magnitude of the problem. Customers are also served in line with their support package, ranging from Enterprise to Max Attention support. While Max Attention support customers enjoy the benefit of instant and on-site support, other support packages rely on this ticketing system.

From our needfinding exercises, we found that many SAP users become frustrated when seeking help from SAP, as there is little empathy from support for their problem. We also found that the root of many problems for support is the difficulty users have in defining their problem. As support agents are given a foggy explanation of the users dilemma, adequately finding solutions within the vast collection of KBAs, forums and wikis becomes tricky and tedious. For this reason, ticketing problems bounce from one support technician to the other, further frustrating the customer.
The core function of our prototype is to aid users in defining their problem. As we’re designing this system for mass volume use, artificial intelligence is utilised to service users. After the user inputs their ambiguous problem definition through voice recognition, the system will remove stop words, keep relative words, and throw out additional keywords as suggestions to the user. These relative and added keywords will become widgets in a word-cloud for the user to interact with. Interaction occurs by swiping words away and making relative/key word widgets bigger and smaller, depending on their relevance to the problem. The system iterates until a solution is found, with suggested KBAs/forums/wikis being displayed to the side throughout. This was done using Kivy, a free download application that embeds Python code to create a user interface.

In addition to aiding users define their problem, users get the feeling that the system is working with them to not only state the issue, but to find the answer too. This idea is a direct implementation from the dark horse prototype, where the central theme was support empathy. As users encountered problems, an avatar became available to talk through the solution with them. The funky prototype focused on the intuition of rotating and resizing word widgets, and how users interacted with this interface. Both milestone prototypes had themes user frustration/support empathy themes that became deep-seated in the functional prototype.

4.7 Stanford Dark Horse Prototype: Support Kiosk

Before coming up with the Kiosk, we initially went towards a direction to increase empathy within the support process by tracking the customer’s and support consultant’s emotion and communicating that to each other. In order to grasp the capabilities of current technologies, we looked at a few consumer products already on the market.

NeuroSky Mindwave: A headset “mind reader. Contained EEG sensors that tracked brain activity in two areas. (1) Focus: how well you can focus on one thing and (2) Meditation: how calm and relaxed your thoughts are. We concluded that this technology, while relatively accurate when recording brain activity, was not an adequate indicator for capturing the emotions we wanted to convey.

HeartRate Monitor: Tracks your pulse. In most social settings, especially meetings and business activities and such, users remained calm and at a stable heart rate. Only in extreme cases would the monitor be able to distinguish excitement, and thus it would not be a suitable indicator for our situation.
Using these two devices, we set up a test with 3 trials. The purpose of these trials were to see what were the effects of sharing emotion in a support scenario. The three trials were as follows:

- Trial 1: Support receives client emotion in text form.
- Trial 2: Support receives client emotion in visual form.
- Trial 3: Client receives support emotion in text form.

![Figure 4.12: Trial 1: Support receives client emotion through text form. Rating from “Very Calm” to “Very Frustrated”](image1)

![Figure 4.13: Visual Form: Relayed colors to reflect customer’s emotion. Support referred to a color chart to interpret emotion.](image2)

From this test, we discovered that sharing emotions of the customer to support was helpful. The support consultant would take the customers emotion into consideration in their reply and tailor their response to make the customer feel better. On the other hand, consultants were overwhelmed over time due to constant “frustrated feedback and were likely to become frustrated themselves and just ignore the customers emotion completely. While sharing of the customers emotions was somewhat helpful sharing emotions of the support consultant was not. It made customers feel uneasy if a support consultant was frustrated or unclear on the situation. These findings led us to re-evaluate our efforts and pick a new direction.

### 4.7.1 Motivation

As we rethought our design efforts, we realized that while empathy was important, we were unsure of where we could take those ideas, and considered instead how else we could create
an environment for empathy. What we ended up coming to was a previous idea we had last quarter - a Support Kiosk. The Kiosk was a collaborative workspace where users could have a telepresence video call with a support consultant to visually solve their problem.

The Kiosk was a central location for help, situated in a customer’s office building or in a common area among multiple businesses. It has a touchscreen computer with full access to SAP support resources, including KBAs, notes, tutorials, etc. It is also a facility for quick and easy communication to support via message, phone, or video. The benefits of the Kiosk were meant to be:

- For the customer, it provides a vital resource in maintaining their systems and receiving efficient and centralized support.
- For SAP, it provides a presence of SAP in the customers office, demonstrating a dedication to service and support to their clients.
- It gives the customer a face from SAP to connect and relate to.

4.7.2 Design

In order to bring our Kiosk to life, we used two projectors, a wide angle lens webcam, and two large screens. The set up is demonstrated in the following pictures.
Figure 4.15: Webcam and Microscot Kinect set-up

Figure 4.16: Pico projector to display screen for Kinect touch system
CHAPTER 4. DESIGN DEVELOPMENT

Figure 4.17: Main projector for telepresence projection of support consultant

Figure 4.18: Overall setup
4.7.3 Results

From our user testing, we discovered that the size of the support consultant’s projection was quite important. If the projection was too big, the user felt uncomfortable and intimidated by such a large image. Successfully, however, the Kiosk did accomplish our original goal of being able to change the users environment to make them feel more prepared to tackle their problem by placing him in an open communication setting. Although users did report a better support experience as opposed to just using their own laptop, the distance to the Kiosk in how much they would have to travel to use one, was an issue of concern. This led us to the direction of creating a portable system which would travel to the customer.

4.8 Stanford Funky Prototype: Support Robox

4.8.1 Motivation

Our goal in building the Support Kiosk was to create a more engaging support environment for the customer. Essentially, we wanted to bring a high touch experience to the low touch user. Through the user testing, we found that users were more engaged and focused, but still preferred to work at their own desk and did not want to have to walk too far to use the Kiosk. Thus, we wanted to develop something that could bring the same features and experience of the kiosk to the customers desk.

4.8.2 Design

In order to bring support to the customer’s desk, we developed a device that could provide quick and easy communication with SAP with a simple UI to support resources. The device had to be both small, due to the limits of a customer’s desk, and still be able to create and engaging support environment as the Kiosk did. To this end, we imagined a small SAP robot assistant appearing at the customer’s desk whenever they needed help.

The idea of the Robox was selected. Robox is named by combining two words - Robot and Box, which indicates the design’s compact box shape for storage and portability and the robot shape and function when being used to conduct video call with a support consultant. The original design sketch is shown on the figure below:

The Robox has two working modes and two screens. In the Sal mode (self-search function), the body screen displays SAP support information and resources, guided by an SAP avatar displayed on the head screen. In the Support mode (video call with support consultant), the head screen shows the camera feed of support consultant and the body screen shows any additional information the support consultant may share to the customer. In addition, a detachable keyboard is also provided for ease of typing and can be stored into the body of Robox. The system diagram is constructed and shown below:
Figure 4.19: Robox Design Sketch

Figure 4.20: Robox System Diagram
The body of the Robox was rapidly prototyped using foam core. A 7-inch Android tablet was used as the head screen and a 10-inch Windows 8 tablet was used as the body screen. The complete Robox is shown below:

![Figure 4.21: Robox Final Design](image)

### 4.8.3 Results

Our primary objective was to compare the experience of the Robox to that of the Kiosk, and so we test the Robox with the same users that tested the Kiosk before. We found that:

- The touch interface must be more appealing to use than the keyboard, otherwise our user would be more inclined to use their own computer.
- Users liked the convenience of working at their own desk so that they can work in an environment they are familiar with and have easy access to what they need.
• The small size of the screen is difficult for more involved interactions, especially if it is a touch screen.
• Users were easily distracted by their surroundings and the experience was less engaging than that of the Kiosk.

4.9 Stanford Functional Prototype: Support Booth

4.9.1 Motivation

After the previous two prototypes, we took a step back to define what users truly wanted when they contacted support, determining that the nature of support simply is - help. We realized that most telepresence and video conferencing systems put people in a face-to-face
configuration. This likens itself to more of a meeting or instruction scenario when people are talking at each other to give commands or share a conversation. However, in most help scenarios such as tutoring, people are generally sitting side-by-side on the same level. In this configuration the focus is on the object of help; in the case of tutoring it is a textbook or homework. Similarly, if an onsite support consultant was sent to the customer, they would be sitting next to them focusing on the problem on the computer screen. They would be working together on the same side of the screen, looking in the same direction not opposing each other as most systems do.

This revelation led us to our Functional Prototype, which we call the Support Booth. Our idea here was to bring the support consultant right to the users side to simulate a more helpful, shared experience. The user would feel as if the consultant was fighting their problem alongside them, engaged in more of a partnership as opposed to a separated collaboration with the face-to-face configuration. In this way, we hoped to provide a more realistic environment that also conveyed more empathy to the user.

4.9.2 Design

To create a side-by-side support experience, we designed a booth using a front table and side wall fabricated from plywood and 2x4’s. On the front table was a keyboard, mouse, and computer monitor using TeamViewer for remote desktop capability.

Embedded inside the wall was a 24” television, wide angle lens webcam and keyboard, all connected to a laptop running Windows 7. The wall was 5 ft. x 5 ft., using 4 vertical bars and 3 horizontal bars.

Triangle supports were fabricated on each side to maintain stability of the wall. Within the two middle bars, a space of 22.5” x 14” was made using two horizontal 2x4’s and plywood to create a frame for the television.

To use the system, the user entered the booth and accessed the video call system by inputting their ticket number as the code. Once logged in, the support consultant called the user using Skype, whereby the user answered the call by pushing shortcut keys on the keyboard (Ctrl + 0 to answer, Ctrl + 1 to end). Once in the call, the support consultant appeared in the television as if they were looking in the direction of the front table. Essentially, the consultants profile was shown to simulate their presence to the side as opposed to in front. Both participants used the remote desktop on the front computer to screenshare.
4.9.3 Results

In testing, our objective was to test the critical experience of having a side video call. The objectives are described below:

- Determine usability of video call system.
- Determine if the user feels comfortable having a side-by-side video call.
• Determine if the user can realize attention cues through their peripheral vision of the side screen.
• Determine if the support booth is overall an effective way to communicate.

We wanted to test the booth first as a communication tool using a sharing and conversational scenario as opposed to a support scenario. Therefore, users were asked to share with the support consultant any websites or products they liked using the remote desktop.

With success, users did feel the experience to be more realistic and the system was easy to use. They enjoyed the separation of the video call screen from their primary computer screen. Because of this separation, both participants could tell whether the other was looking at their computer or the other person. This is different in a face-to-face call because users look in the same direction whether they are focused on their computer screen or the other person. Whereas some felt this separation was productive by limiting inattention, others felt more obligated to look at the other person when being spoken to. We noticed that users tended to look back at the other person primarily to acknowledge or receive confirmation for something just stated. Moreover, the limiting of inattention would prove much more efficient in a support scenario so that both participants can visibly see where the other person is focused.

Users did provide useful feedback for future iterations. If the television screen was set too far back or directly to the side, users would either have to scoot their chair back or turn their head a full 90 degrees to face the other person, which they thought was a hassle. Instead they preferred the screen set more forward and at an inward angle so that facing the
other person required less effort. While looking forward, users could see the other persons movements through their peripheral vision, but could not specifically see what was the type of movement, whether it was a hand wave or a head turning. This meant that users could not register any cues to grab their attention, which is an important aspect in normal communication that we would want to emulate with the design.
5 Design Specifications

Moving forward from the prototypes from our design development, weve come up with our design for Spring, SAP ENGAGE.

ENGAGE is located at every customer office building, where business and IT users can approach the system whenever they have a problem with their SAP system. Users can use the interactive search system to self-solve their problem or log into the telepresence system to resolve their issue through video call with a support consultant. The design is relatively small so that it can fit inside a separate room or be in a common area of an office, with a height of no more than 5 ft. since the user is sitting. The front table is large enough to fit a touchscreen monitor and have room for documents, a keyboard and mouse. The user sits in a chair with full degrees of movement for comfortability. ENGAGE has four primary functions:

- Interactive search: A system that enable users of SAP support to define their issue and acquire the related information intuitively and quickly. It aims to reduce frustration and introduce a feeling that the system is working with you to define the problem. Empathy and understanding are evident in the methodology and delivery of the solution. The functionality of the envisaged final prototype focuses on delivering improved functionality to the user when they are attempting to solve a problem themselves through the SAP support site, especially the types of problems that are related to system setup, how-tos, or that require further information such as tutorials vs those caused by bugs (which only form about 8% of issues). In order to have a more interactive support portal our vision is to introduce technology such as the touchscreen to provide the user with tools that enables him to have some control over the search procedure by giving more information to the system. The differential from others search web portals is that the user can give priorities to one or more words when he changes sizes, so the system will understand which information is more relevant and give a quick feedback, like showing related words, such as synonyms, and displaying possible solutions on the other half of the screen so that the user can go and check if the right solution was provided, this interaction only stops when the user choose to. The systemic process is described in Figure 5.1, and the proposed web portal user interface is shown below in Figure 5.2.
Figure 5.1: Self-Search System Diagram
Figure 5.2: *Web portal user interface*
• Side-by-side telepresence: The consultant will appear in the side display to simulate a real side-by-side support scenario, and both users can use remote desktop software to screen share. The side video display is set forward at a 45 degree angle so the user does not have to turn their head much when facing the support consultant. The consultant appears in the screen as if they were sitting next to the user, looking in the same direction as the touchscreen computer. A HD webcam is mounted by the display to relay video feed of the user to support. The user accesses the video call system by inputting their ticket reference number using a touchpad or number pad. The system's microphone is mounted along the wall or table for optimal audio capture. The design constitutes a wall surrounding the user on three sides with speakers positioned at every corner to optimize audio quality.

• Attention cues: To provide the user an indication of whether the consultant is looking at them or their own computer, the video display will move or flash a light when the consultant shifts their focus between their computer or the user.

• Pointer control: As most remote desktop systems allow only one user to control the cursor/pointer at any time, there is usually a struggle with who should be controlling the pointer. Our design will allow each participant to have their own pointer as in a real physical setting.

Figure 5.3: SAP ENGAGE Specifications
6 Planning

6.1 Vision for EXPE

Our product is a solution for AGS, designed to enhance the customer experience in technical support. By this nature, it is very specific for SAP and therefore is not as relatable to the average person. Our plan for EXPE is to showcase our design in a normal life scenario so that it can be experienced by all audiences and easily understood. Our focus will be on exhibiting the key factors of remote communication, connection and collaboration. In addition to providing a well-integrated system for a seamless user experience, we will also emphasize the design’s aesthetics to make it visually appealing.

6.2 Deliverables

Below describes our Trinity partners’ upcoming deliverables:

Robyn’s Trip to Dublin: From 3/16 to 3/22, Robyn will arrive in Dublin and work with the Trinity team to fulfill the following objectives:

- Visit to SAP AGS and AppHaus.
- Development of a similar hardware functional prototype as the one built by Stanford.
- Test Trinity’s Functional Prototype on Stanford’s Functional Prototype.
- Brainstorm sessions over empathy, user and system interactions, and technology to enable these ideas.

Trinity EXPE: On the 11th of April, ME310 Trinity teams are going to host an invent at the science gallery in Trinity College Dublin open for all public to show and tell about Design Thinking and innovation by giving an early idea of what the group is seeking to achieve as a final solution. The project sponsor from Dublin, Tony O’Donnell, will be present as well as other staff members from SAP, they will be able to test our prototype and get a clear idea of our vision and objectives for the final presentation in June. For this day the group aims to deliver a software solution but more focused on the User Interface than on the backend code, since we are acknowledged that the backend is workable and the biggest differential of our prototype is the interaction between user and system on a more empathetic way. So the objective is to present a clear User Interface and a testing scenario that calls everyone attention to be enthusiastic to test and “play” with the prototype by searching for a solution to a problem that will be proposed in form of a charade. See the Figure 6.1 for roles and expected outcomes for each week. We have already purchased our materials, including a touchscreen, a Kinect and a computer.

Below is a list of what we have planned for the coming quarter:

- Continue benchmarking telepresence systems by focusing on the audio system. So far, we concentrated primarily on setting up the video system but havent looked too much yet into the audio system. We know that audio will play just as important a role as video.
• Developing the software to integrate the physical components and functions into one cohesive user interface. We will either need to find a platform that we can use, or develop one ourselves with the help of a CS194 student. No matter how well the design idea is implemented, the user experience will be a significant factor.

• Developing the self-search interface. As a complete solution for SAP support, self-searching functionality will be an important component. Our global partner Trinity College will be in charge of this part.

• Continue investigating other features that can improve the remote communication experience. We will explore how to make side-by-side communication more real by observing co-located scenarios, and explore ways to make remote collaboration easier between the support consultant and customer.

• Constructing the final prototype for EXPE. After the design is finalized, we will fabricate the design, focusing on the aesthetics to make the product appealing to the audience at EXPE. We’ll develop a CAD rendering in conjunction to visualize our ideas in the design process.

6.3 Milestones

Below are the due date for various milestones.

• Trinity EXPE: April 11, 2014
• Part-X Challenge: April 15, 2014
• Penultimate Integration: May 6, 2014
• EXPE System: May 27, 2014
• EXPE 2014: June 5, 2014
• Spring Quarter Documentation: June 10, 2014

6.4 Distributed Team Management

With a global team, maintaining organization is one of the most important aspects of our project. To ensure that everyone has easy access to information flow, we used communication channels that all of us readily use. We consistently use email to communicate big ideas and Google Drive to share documents, notes, assignments, and presentations. We use a Google Calendar to share each teams upcoming due dates and assignments. We also created Facebook group to act as a blog and medium to share causal information and quick links to interesting information. Every Monday at 8:30am PST/4:30pm GMT, we have a Google Hangout with each other to share updates on the previous week, discuss upcoming assignments, and future work. We will be continuing these meetings into the future. Additionally, we have formal TelePresence calls between SAP Ireland and SAP Palo Alto with the both teams and our liaisons every month to update everyone involved on our progress thus far.

6.5 Project Budget

The following table summarizes the expenses for our three prototypes this quarter.
### Table 6.1: Expense Summary for Winter Quarter

<table>
<thead>
<tr>
<th>Missions</th>
<th>Dates</th>
<th>Total ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dark Horse Prototype</td>
<td>1/7/2014-1/30/2014</td>
<td>275.43</td>
</tr>
<tr>
<td>Funky Prototype</td>
<td>1/28/2014-2/13/2014</td>
<td>555.48</td>
</tr>
<tr>
<td>Functional Prototype</td>
<td>2/11/2014-3/6/2014</td>
<td>30.05</td>
</tr>
<tr>
<td><strong>Total Expense</strong></td>
<td></td>
<td><strong>860.96</strong></td>
</tr>
</tbody>
</table>

The overall budget status of the Stanford team is shown by the table below. We are under the budget so far, which means we have more money for the final prototype in next quarter, totaling $6158.09.

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Allocation ($)</th>
<th>+Rollover ($)</th>
<th>Actual Expense ($)</th>
<th>Rollover ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>1000</td>
<td>1000</td>
<td>412.47</td>
<td>587.53</td>
</tr>
<tr>
<td>Winter</td>
<td>3000</td>
<td>3587.53</td>
<td>1429.44</td>
<td>2158.09</td>
</tr>
<tr>
<td>Spring</td>
<td>4000</td>
<td></td>
<td></td>
<td>6158.09</td>
</tr>
</tbody>
</table>

### Table 6.2: Overall Budget Status

Most resources utilized by the Trinity team were borrowed from Trinity’s Mechanical and Manufacturing Department such as computers, cardboard, post-its and cables, or from team member contribution like an iPad and camera to record videos and take pictures. Our biggest investment was the touchscreen acquired for the Functional Prototype. As the prototype was a software solution the team do not expect to spend much more money on hardware - only if we expect to integrate more hardware technology like webcams, a Kinect and voice control.

<table>
<thead>
<tr>
<th>Date</th>
<th>Vendor</th>
<th>Description</th>
<th>Amount (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03/07/2014</td>
<td>Amazon.com</td>
<td>LG Touchscreen Monitor</td>
<td>283,00</td>
</tr>
<tr>
<td>03/07/2014</td>
<td>D.I.D. electrical, mountjoy square, dublin</td>
<td>Mini HDMI</td>
<td>23,99</td>
</tr>
</tbody>
</table>

### Table 6.3: Trinity Expenses

#### 6.6 Project Time Line

Trinity’s project time line is made based on the 4 weeks before the Trinity EXPE. Their tasks are basically divided between Research and Development, Code Implementation and Tests, Brbara Silva and Kevin Burke will spend most of the time searching material to help on the code implementation while Michel McHugh and Vinicius Serra will concentrate their efforts on code implementation, prototype testing are to be made every week with all participants present to brainstorm about the use interaction. There is also a visit to SAP scheduled for the 20th of March and the week antecedent the presentation just for final
adjustments and details about the presentation. See Table 6.4 for expected outcomes each week.

<table>
<thead>
<tr>
<th>Week</th>
<th>Stage-gate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A clear layout: 1st- All words should be appearing close to the center of the screen 2nd: The user should be able to change words size even if the word is very small</td>
</tr>
<tr>
<td>2</td>
<td>1st- Words that are related to one another should appear on a logical way. 2nd: Create a User persona to be our potential user.</td>
</tr>
<tr>
<td>3</td>
<td>1st: Words possessing a higher weight should appear on bigger sizes 2nd: Join outcome from week 2 to week 3, words presented on different sizes and positioned according to its relations to one another.</td>
</tr>
<tr>
<td>4</td>
<td>Two screens presented, the first half with the word cloud and the second displaying a list of possible solutions</td>
</tr>
<tr>
<td>5</td>
<td>A prototype with a clear User Interface, easy to use and providing a list of solutions.</td>
</tr>
</tbody>
</table>

Table 6.4: Expected outcomes and stage-gates from TCD EXPE

See Figure 6.1 and Figure 6.2 for Project Time Line.
Figure 6.1: *Gantt chart showing next 4 weeks of TCD project timeline.*
Figure 6.2: Gantt chart showing Spring quarter project timeline.
6.7 Reflections and Goals

6.7.1 Vinh Bui

The team here at Stanford and Trinity have both come a long way since last quarter. The light at the end of the tunnel has gotten much brighter for us all. Since our meeting with the Trinity team in Dublin over Christmas break, much progress has been made towards a viable direction. There were some good ups but still plenty of downs. We liked the idea of our dark horse but really struggled through the funky right up until the functional, and almost had no idea what we were going to design. It seemed we got too stuck within our box of thought. Luckily we were able to find a direction that we all were excited about. The real challenge, however, is how to make that idea a reality to the best it can be, and I hope we don’t get stuck in that box again.

We’ve had arguments within both teams as ideas were contested, but we’ve settled most of our differences. I think both teams are on track to being able to design a cohesive integrated product once EXPE arrives. However, there are things that I want the Stanford team to keep in mind so that we can execute successfully as a team during Spring quarter and have a good show at EXPE. The ambiguity from Fall quarter has been significantly reduced, but the challenge to build something cool for Spring is constantly looming over my head. This quarter was one hell of a ride, and honestly I just need a break right now. I’m looking forward to coming back into Spring poised and ready to tackle SAP’s challenge.

6.7.2 Kevin Burke

From the beginning of the project, there was underlying ambiguity from the brief as to who the end user of the design was going to be. We found that both the user and support technician had issues with communication during the support-seeking procedure, with a lack of empathy causing user frustration. This was an early challenge in the design process, as both sides of the team had to converge on the end user.

Being part of a group of mechanical engineering students doing a software-based project, this has provided a challenge in itself. Our academic background is not rooted with software functionality. However, the team is now learning the Python language to build up a user interface for future SAP support, a challenge that has been tackled proactively by the group. The software design process has been testing, but I feel the team has risen to the challenge. In light of this, it was surprising to find an online application such as Kivy that we can use to build a user interface, yet alone for free. I did not expect the framework of our project to be accessible so easily, software capabilities notwithstanding. In addition to this, having telepresence meetings with all team members and an abundance of SAP contacts and academic staff present has made the project run more smoothly since the new year. Having constant, dependable feedback from multiple sources has provided the team with a more stable design development process.

As we enter the last quarter, I think the team has learned a lot from the initial needfinding and problem identification stages. The focus the final stage will be to enhance the front-end user experience of our software, as we’ve learned that focusing on back-end/semantic/algorithmic development does not suit rapid prototyping. As a group of mechanical engineering students, our naive eyes should be reimagining how people seek sup-
port and revolutionising the support experience.

6.7.3 Yongbin Han

The project is tough, because of its software nature. We spent a lot of time this quarter struggling on generating ideas that could be realized as a tangible product. Course missions came to us one next to another and I feel we didn’t really have time to think more about ideas and directions. Because of the lack of communication with SAP and the slow reply from SAP, a lot of prototypes we built were under assumptions we made by ourselves. We were lost and didn’t have a clear direction at the most time in this quarter until we chose the side-by-side remote communication. Although it is still not a very exciting idea for me, it is acceptable. We still need to come up with some really good and innovative features to make it a “Wow” product in next quarter.

6.7.4 Mike McHugh

The principal stumbling block on the project over the last month or two has been the attempt to incorporate a computer science graduate (CSG) assigned to our groups from January into the design thinking process to help develop software aspects. In time we found that the CSG was not operating by design thinking processes of quick iterations, prototyping fast, learning, and moving on to the next iteration but rather focused on a more long term design specification template process in line with usual development procedures they had encountered so far in their software projects. Perhaps in future if a computer science element (software) is to be explored as part of the project (and should it not be the user needs that dictate the solution, rather than the mechanical background of the students, professors or a courses past? The fixation with hardware in ME310 speaks of a closed, and at times counter productive, mindset to me.) then perhaps the students chosen to fulfill that role could be brought in fully as part of the groups from the beginning of the project.

6.7.5 Robyn Nariyoshi

While I feel that we are still struggling with the vision of the final product, this quarter was very positive. We finally established a clear direction and found a real need to focus on. I feel working in a three person team, while more work than a four person team, it definitely allowed us to coordinate more efficiently and ensured everyone’s involvement throughout the quarter. Next quarter, I am hoping we solidify our final vision. I’m super excited for EXPE and I know that will come all too soon.

6.7.6 Vinicius Serra

During the entire information gathering we had some insight of the flaws and strengths of the current SAP support system and how it projects to an environment where support will be carried out to the end consumer (B2C) no longer just for large companies (B2B).
One of the main strengths is the fact that most of the information needed to perform support is already available via Wikis, Knowledge Base Articles and Forum posts. Especially in relation to problems of How To Do, which are the majority and tend to grow more and more when they go towards the Cloud. Which brings us to a major problem that is the difficulty of accessing this information, it is easier for the user to send a message asking for support than to find this information in the portal. Another major weakness that we need to consider is the fact that the user have difficulties trying to define their problem, for several reasons such as forgetting to mention important information, do not know the correct vocabulary or do not really know what is going on. What happens then is a Ping-Pong of messages between user and support. Based on these three points, and some other insights as to minimize user frustration, we decided to explore the prototype that we are currently building, which is a software where the user enters information related to their problem and the system generates a Word Cloud where the user can interact, removing and adding words, changing sizes for each of them and receiving more related words that can lighten their ideas. And according to this Cloud he gets results like on a search tool. The concept is that the user, through the various iterations, can put into words and in visual way what he has in his mind as being your problem, also helps remove frustration since he has the feeling of working towards finding the solution, not just waiting for a message of support that can take days and just be a request for more information.

The big challenge now is to put this concept into practice through prototyping, as it involves a fully software based solution and we do not have the programming background. However, we are learning a lot in this process and have found some tools that will help us build and test this concept in order to make improvements and confirm if it is really an ideal solution.

6.7.7 Barbara Silva

On this quarter not a lot of change was made in regard to the design concept of ours prototype, we have been working towards the same direction since the Dark Horse Prototype. Both teams, Trinity and Stanford, envision a more empathetic support, as Stanford team members have good mechanical and manufacturing skills the development of a hardware that provides this kind of support service is parallel to the development of a software solution that can work and be the first interaction a customer have when reaching for SAP support, I believe with this software and hardware integration we close an important gap that is scalability, not only Max Attention customers will be benefited by this new product concept but also the 1 Billion mass can have access to a more personalized support web portal with no need to pay extra amount of money. Max Attention customers already allocate a good amount of their resources on SAP products to assure that an efficient and effective support service is provided, so a hardware solution that shows why this resource is invested on SAP products and not on another software competitor is of great importance since the interaction and level of service quality are enhanced when there is a direct connection to a human on support service.

In regards to time management, resources allocation and roles I believe Trinity team had some issues, once we made our choice to go for a software solution our skills resources got limited since not all team members are keen on software and has a good programming
background. Close to the delivery of the functional prototype the group made a strategic shift, choosing not to have a computer student to help us to develop the code and go ourselves to start the development, for this reason our functional prototype did not have all requirements expected, but was of great importance in order to prioritize the next tasks.

For the next quarter I expect a better role division and more testing sessions so we can concentrate on feedbacks given and have a very fast prototyping process, since we work on a software and focused on the UI every single feature implemented has to be tested as fast as possible to make decisions if the functionality is enhancing interaction and should continuing on developing on it or if we should change and go on another direction.
7 Resources

7.0.8 Corporate Liaisons

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Bibliography


A Appendices

A.1 Fall Benchmarking

A.1.1 User Benchmarking and Needfinding

After brainstorming, we wanted to get a better understanding of what different “support” systems and organizations were like. We talked with a number of different individuals involved in different support networks to discover key aspects that defined that support.

A.1.1.1 Wanjin Park and JeongSoo Sim, Korean Military Personnel

The military, in general, is a rather extreme instance of support - they deal with life and death situations everyday. The soldiers on the front line need access to mission critical information and supplies at a moments notice, which puts added stress on supporting entities. Talking with soldiers from the Korean Army, we discovered that personal problems are usually ignored in order to focus on team issues. Also, each soldier has a “battle buddy”, or someone there to help in supporting individuals with smaller problems, while more serious issues can be escalated to higher ranked individuals or counselors. They mentioned that their main pain point is relating to the hierarchical management system, where small changes up top result in significant hassle for lower ranking soldiers.

![Image](image.png)

Figure A.1: *Wanjin Park and JeongSoo Sim of the Korean Military.*

A.1.1.2 Deepak, QA Manager, SAP

Deepak is tasked with quality control for SAP product releases, and has certain expectations and definitions of support within his organization. His focus was largely on how SAP can effectively support its customers. First, he mentioned that users need a consistent, structured way to receive support 24/7. This way, when scaled to large user bases, every user is familiar with SAP operations. Much like manufacturing, when looking at how to effectively scale, standardization is key. SAP currently implements a ticketing system, wherein users submit a “ticket” to SAP support representatives that contains all information relevant to the problem. This ticket enters into AGS (Active Global Support), which provides 24/7 support to all SAP customers, regardless of time zone. The level of action required by SAP is dictated by the SLA (Service Level Agreement) between SAP and
its client. As issues are processed and resolved, tickets may escalate from primary to secondary support, and eventually back to development engineering. This standardization makes some aspects of support easier because all issues are documented in the same way, but in somewhat inefficient and slow from the customer point of view. It is also difficult to scale this type of support structure to 1 billion users.

A.1.1.3 Alan Fahey, Support Team Manager, SAP

Alan Fahey talked with the Trinity College team regarding SAP’s current support business model. He pointed out that 55% of SAP’s revenue is through support - and this support is 96% profitable. He also mentioned some of the biggest complaints regarding SAP support, which is most commonly that “it takes too long”. It takes around 5-6 days for SAP Ireland to solve a customer problem. He feels that moving toward more KBAs (knowledge base articles) will help to improve the systems efficiency. He also pointed out that most companies, including SAP, are moving toward cloud support. The business model is slightly different for cloud support, where more users will pay a smaller fee, but will have less data to maintain. Making system changes from the cloud much easier, but “the hardest part is to get customer to do what we tell them”.

A.1.1.4 HK Ueda, Sr. Product Launch Manager, Tesla Motors

HK focused on the importance of adaptability of large corporations in order to meet the needs of startups and growing companies. This will apply to SAP as they aim to support one billion people. Each person will not have the same needs, so solutions and support systems need to be more adaptable to meet the needs of many. In his experience, large corporations like SAP tend to deal with huge contracts and lack the startup focus, when these start-ups may become their next big contract. Existing implementation strategies and infrastructure may not be able to adapt to a new, fast moving company. Tesla ended up developing Tesla “Warp Drive” to replace traditional ERP software in order to tailor the
software to Tesla’s needs. Differing business models simply need different ERP software, as startups need a “flexible platform that can adapt quickly to fast moving companies”.

Figure A.3: HK Ueda from Tesla Motors.

A.1.1.5 Rongwei Ma, Oracle Software User

As an end user, Rongwei focused on the software’s usability. She said that the user interface is not intuitive and is a bit intimidating at first, even though the software is really pretty easy to use after a short learning period. She suggested simplifying the procedure to do simple tasks, which sometimes requires more work than really necessary. She also noted that slow network connections significantly decreases operator efficiency, and while this is not purely a software issue, it still brings a bad image to the software developer.

Figure A.4: Rongwei Ma, a Oracle software user.

A.1.1.6 Mark Schar, Proctor and Gamble, Intuit

Mark’s company had gone through the switch to SAP software at one point, and he mentioned that they experienced significant frustration during the switch. End users who could not see the end benefit of the new software were angry and frustrated. While the software did increase functionality in the end, the transition was not near as smooth as it should have been. He also suggested that we look into TurboTax, as they support 24 million people in a three month period - a high volume and high stress scenario that could be analogous to SAP supporting 1 billion users.

A.1.1.7 Kimberly Meek, Vice President, AGS Primary Support, SAP

Kimberly focused on SAP’s need to move away from the ticketing system. They understand the system’s shortcomings, and have a grand vision for “support without messages,” but have no method to achieve this yet. She said that SAP needs to humanize the customer/support representative interaction by actively encouraging phone support vs.
email/messaging support. Part of this is improving their remote support and diagnosis capability and being more proactive in avoiding problems by moving product support from “fix it” to “prevent it.” It also will involve encouraging more interdepartmental collaboration within SAP and within AGS. SAP’s efforts towards these goals to date include improved remote infrastructure and more “message deflection” through on-line forums and KBAs.

**A.1.2 Business Benchmarking**

We thought it was important to outline the business features and structures of SAP before fully embarking on the design challenge. We focused on major areas of the business to outline exactly what made SAP’s business a competitive figure in the market so that our eventual design will fall in line with the company’s overall goals and mission statement.

**Key Activities:** SAP strives to help businesses run better using their systems to “operate profitably, adapt continuously, and grow sustainably.” [1] Some major activities are enterprise software development and sales and software implementation and support.

**Value Propositions:** SAP’s products are a huge value proposition for many businesses, providing organized and streamlined methods for business management and customer relation management. Their software helps to standardize processes, provide analytics, improve resource planning, and reduce costs while minimizing risks.

**Customer Segments:** Primarily medium to large enterprises, but small businesses as well.

**Cost Structure:** SAP’s cost structure is definitely value driven. Costs are calculated through research and development, sales and management, general and accounting, and new company acquisitions.

**Revenue Streams:** 45% of SAP revenue is from software sales and 55% is from support and services. However, software sales are less than 10% profitable, whereas support is 96% profitable. When purchasing a software package, companies choose a SLA to determine the level of support they require. The support cost is a percentage of the price of the software package. The vast majority of companies choose the Enterprise SLA option. Below are the different SLA options and take rates.

- Standard: 17%
- Enterprise: 22%
Key Partners: SAP has many different partners who play an important role in helping other organizations identify, purchase, and implement solutions to address their unique business needs. Partners help with resale of software products, partner-developed solutions, consultation and implementation services, support, and more. Some example partners are IBM, HP, and Accenture [4].

Channels: SAP’s channels to customers are primarily through consultants, sales teams, and partners. Brand awareness through other major enterprises is a key factor as well.

Key Resources: Software engineers, consultants, partners, computing resources (servers, databases, cloud).

Customer Relationships: SAP not only has over 251,000 customers, but also reaches these customers through third party consultants. They maintain these relationships with their partners through both their sales team and support organization. Depending on the SLA, there are sometimes on-site TQMs available for the customer.

A.1.3 Technology Benchmarking

After developing a solid understanding of the design challenge given by SAP, we decided that supporting large user bases was the essence of the problem and began investigating different means for support. There are very few companies that directly support one billion end users, such as Microsoft, Google, and Facebook, and most of these companies develop very simple and intuitive software that has very little need for support. Given the inherent complexity of SAP software, the support model of companies such as Facebook is not likely to be directly relevant to SAP support, and thus we decided that investigating different means of support more generally would be beneficial in further defining the problem. Five main avenues for customer support were identified, and are outlined below.

A.1.3.1 Phone Support

Phone support is one of the oldest methods of remote support for large customer bases. Users call in to large support centers wherein they verbally describe their problem to a service representative. This is fairly easy to implement as phones are easily accessible by most customers, but is largely not scalable to extremely large user bases and can be both inefficient and frustrating to both customers and service representatives. Long waiting times, which waste customers’ time, are typically associated with phone support, but some companies, such as Amazon, are beginning to solve this problem by scheduling support calls in advance. In this scenario, the service representative calls the customer when he is free. Phone support also does not provide service representatives any time to research the problem, and essentially puts them “on the spot”, where the customer is waiting for an answer. Some customers also find it difficult to explain a problem verbally in an articulate manner, and there is sometimes significant misunderstandings by both parties due...
to language barriers, poor connections, and many other factors. The team has found that sometimes problem identification is one of the most difficult aspects of customer support, and phone support provide no means to “show” the support representative the problem, which can lead to further misunderstanding.

A.1.3.2 Email/Message Based Support

Message-based support has become increasingly more common in today’s web based society and can be implemented through email, chat, or some other messaging client. Users type a written description of their problem and send it off to a service representative. The service representative then researches the problem and responds to the customer with a solution. There is zero idle waiting time for either party, as they respond at their convenience. Users have a full record of all correspondence and can refer back to previous conversations to clarify new issues. This allows sufficient time for both the user and the support representative to form a good understanding of the situation, but can also increase response times and leave the customer with a sense of ambiguity as to the state of their situation. Many newer support services also allow attachments, wherein a user can attach a screen-shot of the problem or some other alternate method for “showing” the support representative the real problem. We also saw many situations where either the customer or the support representative did not adequately explain their situation, leading to miscommunication and misunderstanding. For text support to be viable, both the customer and the support representative must form a cohesive message that succinctly and fully explains the problem or solution, which is not always possible. Message-based support is also very indirect, as
it provides no personal interaction and promotes a perceived lack of responsibility from both parties. By allowing users to simply ignore messages or redirect questions, message based support can be ineffective. Sometimes long chains of emails form, and correspondence continues without any real problem solving.

A.1.3.3 In-Person Support

Many companies now implement in-person support through storefronts or mobile service technicians. In-person support is very effective because it allows users to clearly describe the problem and for support representatives to easily understand the problem, as all forms of human communication are available (verbal, gestures, body language). Users can also “show” the problem to the service representative in many cases, which makes developing a full understanding of the situation much easier. Being able to show the problem to others is possibly more suited to hardware issues, but is also beneficial in solving software problems. This also provides instant response (aside from waiting in line at storefronts), as it is a real-time human interaction, but is also largely not scalable due to cost limitations. Mobile technicians are also a very effective problem solving method (albeit expensive), as they can come at the customer’s convenience and see the problem for themselves, which makes understanding the situation much easier. While effective, cost and scalability largely limits the practical implementation of such a service network.

A.1.3.4 On-line Support

More recently, many companies have been turning to on-line support via user forums and search-able databases. This is really an interactive extension of a more traditional user manual, as it provides explanations of key functions and solutions to the most common problems. Forums create a community that allows others in a similar situation to work together to understand and solve problems. This is very good for the business model of most companies, as it decreases running costs by effectively leveraging other users to solve problems that the company would typically have to solve themselves. While this can be very effective at solving problems and is very scalable, the company is somewhat losing control over their support network. They must rely on third parties to help customers solve problems, but can moderate forums themselves and help to control support situations. On-line support can also allow for support representatives to take control of a user’s device to fix problems, which makes it easy to understand the problem, but does pose some security concerns with more sensitive data.

A.1.3.5 Physical Support Devices

Some industries employ physical devices designed for solving specific problems to help users. This is typically found more in large corporations and industry, but some technology is coming down to the consumer level. One example of such a device is the OBD (on-board diagnosis) systems in modern automobiles. Vehicles now log many parameters and error codes, and historically this data was only available to service technicians at a dealer. With modern advancements in technology, consumers can now purchase OBDII scanners for as little as $20, and can read trouble codes and inform users of the real problem. The electronics in the car can identify problems, forgoing manual diagnosis methods to allow
for more accurate and efficient problem solving. Another example of a physical support
device is the UPS Diad V. This hand-held device connect UPS drivers to the corporate
network and gives them access to any data they need to support their daily tasks. Using
these physical support devices, the end user is connected to a large support network by
means of a personal device.
A.2 Fall Critical Function and Critical Experience Prototypes (CFP/CEP)

A.2.1 CFP: Sliding Monitor

After benchmarking and user needfinding, we distilled our problem down to a few things. At the center of the AGS system is where the Support Engineer sits. He or she must be able to communicate and collaborate clearly and effectively. This means providing him or her with the right tools and workspace. These tools must do the following:

- Allow clear communication between customers and support.
- Enable customers to better identify their problems through technology.
- Encourage collaboration amongst engineers to more effectively provide a solution.

In essence, how can we innovate on the tools and technologies present in SAP workspaces to improve the efficiency of communication between support and the customer? In this way, we can evolve SAP’s support organization to readily meet the needs of 1 billion users.

Based on our interviews with AGS managers, the design team decided that improving local collaboration would be worthwhile to explore for our CFP. We identified certain issues involving communication and collaboration amongst SAP support engineers. In particular, these engineers tend to “hide” behind their large desktop monitors in high-walled cubicles as seen in Figure A.7.

This essentially acts as a wall, blocking users off from others around them, and enveloping them in their own world of work, which can inhibit collaboration, and ultimately lowers worker productivity. The office space is generally too quiet, which inhibits users from picking up the phone to more quickly solve a customer issue. Moreover, ticket issues fall to the notorious “ping-pong” effect where issues get bounced around to different engineers until they reach the right person to solve them. In view of these pain points, we re-examined the prompt and were able to use the task of improving next generation workspaces to increase collaboration and open communication channels as a viable option to help in supporting 1 billion users.

By taking a large touchscreen monitor and creating a mount that allows it to convert from flush-mounted in a desk (essentially becoming part of the desk) to a traditional upright monitor, users can change from an open, collaborative environment to a traditional, more personal workspace at the touch of a button (or anywhere in-between).

User feedback showed that this prototype does open up the space for more efficient communication and collaboration, see Figure A.11. They enjoyed the transition of the workspace and the flexibility of multiple modes. Users were also asked to focus on their preferred method to interact with the transitional mechanism. Users preferred either tapping the screen, pressing a button, or using a gesture to control the screen. Some people mentioned that they would like a physical slider to adjust screen position. Users also enjoyed the action of sliding out a keyboard to actuate the screen, but didn’t like voice or foot control.
Figure A.7: Cubicle office of Support Engineer at Sybase

Figure A.8: CFP sliding monitor in upright configuration.
Figure A.9: CFP sliding monitor transitioning from the upright to the flush mount configuration.

Figure A.10: CFP sliding monitor in flush mount configuration.
Figure A.11: *Example collaboration setting of CFP.*
A.2.2 CEP: Support to Customer Interaction

We based our CEP around communication between a customer and a support technician by creating a process and environment to simulate some of the main themes we have seen from our observations and through our interviews; problem definition and difficulties in communication of an issue. We also wanted to get insight from both groups, customer and support, about their experience, and we wanted to see how accurate the “experience” we built was to our expectations.

We created a MATLAB file that played a piece of speech from an audio file that had been sped up and reversed, making it unintelligible. This MATLAB file was presented to the “customer” and they were asked to contact a “support representative” via an Internet chat client to help them fix the sound file, and then solve a further problem we had set in the speech.

The speech within the audio file said “Please translate this Latin phrase: Ubi est tabella spicularia” which translates as “Where is the dart board?” This was partly to see the difficulties encountered if the customer had translate through different mediums; from Latin to phonetic English into text which the support technician would then have to deal with.

We then created a tutorial for MATLAB that had examples of how to process audio, with many differing production techniques in it, two of which were how to adjust the speed, and how to reverse the sound. We called this file 'audio processing' and placed this tutorial in a folder with many other documents to simulate the search a support tech would need to undergo to find the right information to use to identify and help the customer solve the problem. We also gave the support technician access to the Internet if they wanted to use it.

Here are the guidelines we gave the customer:

Please describe to support as best you can what you hear when you run this file, and get them to help you to 'fix/solve' it. Your only allowed avenue of communication is through an internet text chat client. You may only operate within the chatbox, editor or command window of MATLAB. i.e. only use support chat for help; no Google or MATLAB help for you. Don’t forget the prize for quickest solving of complete problem is a free meal! MMMmmmmmmmmmm!

And here are the initial guidelines we gave the support technician:

In this simulation, you are a support technician attempting to help solve a users problem. Your only allowed avenue of communication is text chat within the Internet chat client window. They have no access to the web, help files, anything bar you. You have access to knowledge base articles within this folder, marked KBAs; perhaps one of them has applicable information to the problem. You may also use Google, or any other net based resource you think might be useful. Remember there is a prize of a free meal for the quickest full solution to the problem!
To which we added over time: They are using MATLAB. They have a music file being played in MATLAB, and there are some effects on it that need to be reversed to make the speech comprehensible. There is then a message within the speech to be answered. This was to see how much better the support got as we gave them better information.

We then found sets of volunteers to act as a customer or support technician and documented how they got on. We set a time limit to achieve the solution within fifteen minutes.

Overall we noted a lot of miscommunication, bad assumptions made by both sides, lack of clarity in messages sent, and misreading of messages received. They could not communicate effectively, and the overall overriding experience of all who took part was one of frustration.

To provide the positive experience we would have the enduser in the same situation as before, but whereas before they could only receive help through communication over an internet chat client, with a support who didn’t know the nature of the problem, nor how to solve it immediately, now we will have a person in the room beside the user, who knows the nature of the problem, and will step in when it most suitable to do so to help the user achieve what they want to do, but in a way that also helps to educate the user gain knowledge about the process want to apply. This is a user experience we imagine people would like if they had the need for some support.

So how can we evolve the current negative support experience to our ideal positive? And how can SAP move towards enabling such a process to it's customers? It is not practical to have a support technician alongside the user. But is it possible to build software and support into a more integrated package that gives people useful, intelligent guidance that mirrors this experience to help them solve their issues? What ways can we provide and support the knowledge and feeling of empathy to do this on a 1 billion user scale? Here, as an example, using what we have seen inside SAP AGS already, is an idea of what the current procedure could evolve to towards generating this user experience:

2. Customer accesses a bright, picture based support platform.
3. Product predictive software to find the problem and its solution.
4. They enter a search for their problems (keywords, etc).
5. Support database spits back related tutorial videos (SAP Connect, SAP YouTube-like Channel) and related, simply?written KBAs, ranked by relevance.
6. Peer support forums.
7. If problem persists, customer accesses message solvers.
A.3 Fall Quarter SGM Handouts

A.3.1 Benchmarking Summary Handout

*SAP Benchmarking*
Vinh Bui, Yongbin Han, Darrick Hunting, Robyn Nariyoshi

Goal: Define service & support structures and devices for large user bases. Define key features of each support structure and device.

**Phone Support**
- Traditional method for solving problems remotely.
- Implemented by most major companies, but sometimes highly inefficient due to long wait times and dropped calls.
- Some companies, like Amazon, now have an option for pre-scheduled call times.

**Email/Messaging Support**
- Most companies now implement some form of text support, either via email, chat or other messaging service.
- There is no holding, and a specific question can be directly asked, so it is efficient for both the customer and service representative.
- Very indirect - no personal interaction and a perceived lack of responsibility.

**In-Person Support**
- Accessed through storefronts such as Apple, Microsoft, and Verizon.
  - Immediate in-person response - very personal and enables easy and direct communication.
  - Sometimes large volumes of customers result in long wait times.
- Technician
  - Someone that comes to your home/office to diagnose the problem.
  - Usually deals with hardware issues.

**Online Support**
- Forums and online blogs where users post questions and experts can answer.
- Automated Solutions
  - Windows Fix It Now
- Remote electronic control and support
- FAQ Databases

**OBDII Scanners and OBDII Bluetooth Dongles**
- In years past, auto mechanics and dealer service centers have had sophisticated diagnosis equipment that can read trouble codes from a vehicle’s OBD (On-Board Diagnosis) computer.
- This is now starting to appear in the consumer market, with consumer handheld scanners available for ~$20-$200.
- This is essentially bringing support designed for corporations and large dealer networks to the individual DIYer in his garage.
- Now OBDII bluetooth dongles are available that connect your car to your phone or laptop and you can not only read and clear trouble codes for diagnosis, but you can also see vital vehicle parameters in real-time.
- Some vehicles (such as Tesla) are now connected to the manufacturer via 3G and can be remotely updated and diagnosed in the field.
- This new connectivity is opening up new areas for app developers to explore.

Figure A.12: Benchmarking Handout
Users Manuals
- All cars come with users manuals that are designed so end users can understand functionality designed by the manufacturer and can troubleshoot common issues.
- This can be in a more typical paper format or in digital format.
- Companies like Chiltons or Haynes make maintenance manuals that describe, in detail, most all major maintenance procedures specific to your vehicle.
- Some manufacturers also release fixes to common problems to help support users. For example, Ford releases TSBs (Technical Service Bulletins).
- Audi is now rolling out an augmented reality user manual application where “looking” around a car with your device’s camera allows the app to ID different buttons or functions and explain more about them.

Mobile Devices
- Cell Phones/Tablets
  - Barcode reading applications
    - Can access websites, text information, product information etc.
  - Urgent 24/7 Care Medical Help
    - Directs you to a registered nurse who escalates you to a doctor if necessary.
  - Touch Scan OBD Diagnostics
    - Mobile app version of OBD scanner
  - Mint/Banking Apps
    - Analyze spending data, find best fit solutions for your personal habits.
  - Team Viewer
    - Allows remote connection of smart phones.
- Portable Data Terminals (PDTs):
  - An electronic device used to enter and retrieve data on a database from a remote location via wireless transmission used in large stores, warehouses, or in the field.
  - With increased processing and transmission speeds via WiFi and Bluetooth, users can quickly access data and resources to better perform their jobs.
  - UPS DIAD V, FedEx PowerPad, Rugged Computers

Navigational Support
- Maps are one of the original service/support devices to help people get around.
  - When people are lost or looking for a specific building, they can use local landmarks on the map to find the direction to their location.
  - Huge user base - maps are applicable to nearly everyone.
- GPS is a modern and enhanced version of maps
  - Storing the building/route information into the device creates a searchable database for the user and offers an easier way navigate.
  - Location data organized by “point of interest” so that users can quickly find places.
  - Allows for turn-by-turn directions, or “active support”, to guide users to their destination.

Figure A.13: Benchmarking Handout
A.3.2 Needfinding Summary Handout

Team SAP Needfinding Interviews
Vinh Bui, Yongbin Han, Darrick Hunting, Robyn Nariyoshi

1. Wanjin Park & JeongSoo Sim, Korean Military (CFC & KATUSA)
   ● Personal issues and problems are usually ignored if not urgent enough. More difficult in Korean Army (mandatory) vs. US Army (occupation).
   ● Support usually comes from battle buddies, but problems can be reported to one rank up, counselors, or an online feedback system.
   ● Pain point: Hierarchal system mean decisions affect many, small changes up top result in much hassle for those below.

2. Deepak, QA Manager, SAP
   ● Users need a consistent, structured way to receive support 24/7.
   ● SAP uses a “ticketing” system, wherein any issue is documented on a ticket that goes into the Active Global Support (AGS) network.
   ● These tickets are standardized, and any support agent that helps toward a solution documents their actions on the ticket.
   ● AGS has locations strategically placed throughout the world to continue support 24/7 through all timezones for uninterrupted support.
   ● Individual level of support dictated by Service Level Agreement (SLA) in SAP contact -- sometimes the contract even provides for financial liability for lost revenue due to system down situations.
   ● As issues are processed and resolved, tickets may escalate from primary to secondary support, and eventually back to development engineering.
   ● Takeaways: Need consistent process for all users with standardized documentation and 24/7 support; this may not be as efficient, but it is very scalable as it is so structured.

3. Alan Fahey, Support Team Manager, SAP
   ● User 1: SAP Support
     ○ 55% of SAP’s revenue comes from support with ~96% profitability.
     ○ It takes 5-6 days for SAP Ireland to solve a customer problem.
     ○ Biggest complaints are that it “takes too long.”
     ○ SAP support website: Knowledge Based Articles (KBAs) written by support staff for redeemable points, forum-based community.
   ● User 2: Businesses
     ○ Most companies, including SAP heading towards Cloud support.
     ○ Smaller fee per user, smaller amount of users to maintain.
     ○ “The hardest part is to get customers to do what we tell them to do.”
     ○ Changing systems from the Cloud is much less of a hassle.

Figure A.14: Needfinding Handout
4. HK, Sr. Product Launch Manager, Tesla Motors
   ● Startups and growing companies need a “flexible platform that can adapt quickly to fast moving companies.”
   ● Large corporations like SAP who typically deal with huge contracts need to focus on startups — Existing implementation strategies and infrastructure cannot adapt to a new, fast moving company.
   ● Idea: Smaller, autonomous business units could break off and focus on growing startups — this way every account matters and a product can be developed for a company, not simply adapting enterprise level products.
   ● Ended up developing Tesla “Warp Drive” to replace SAP software in order to tailor the software to Tesla’s needs.
   ● Differing business models need different ERP software.

5. Oracle - Kyle
   ● When an error is detected, the ticket is created in company’s system and is assigned to the technical staff within the company to resolve. If issue cannot be resolved, it will be reported to Oracle support.
   ● The user interface of software is not intuitive and user friendly. People feels “scared” when see it at the first time even though it turns out to be easy to use after a short period of learning.
   ● Using the Oracle software to create tickets for error is easy to learn even for a non-IT background person.
   ● Simplify the procedure to perform a specific task.
   ● The application is connected to the internal network of the company. Becomes inefficient when the network gets slow or has some problem.

6. Mark Schar, Proctor & Gamble, Intuit
   ● Experienced a lot of frustration when switching systems to SAP.
     ○ People were angry and frustrated because they did not see the end benefit
     ○ “It’s amazing they are as big as they are”
   ● Asked the question “Who are a lot of people that do this?”
     ○ Turbo Tax (24 million people)
     1. A consumer application for a complicated system.
     ○ Salesforce.com

7. Kimberly Meek, Vice President, AGS Primary Support, SAP
   ● Currently using a ticketing/messaging system to support customer incidents
   ● Need to support customers without messages
   ● Humanize the customer/support rep interaction
     ○ Actively encourage phone support vs. email and messaging
   ● Improve remote support and diagnosis
   ● Need to proactively avoid problems by moving product support from “fix it” to “prevent it”
   ● Message deflection is a bit part of this goal

Figure A.15: Needfinding Handout
A.3.3 CFP/CEP Handout

Trinity Critical Experience Prototype

*Problem Statement: Define the evolution of SAP services and support to meet the needs of 1 billion end users.*

We based our C.E.P. around communication between a customer and a support technician by creating a process and environment to simulate some of the main themes we have seen from our observations and through our interviews; problem definition and difficulties in communication of an issue.

We also wanted to get insight from both groups, customer and support, about their experience, and we wanted to see how accurate the “experience” we built was to our expectations.

**Insight:** Overall we noted a lot of miscommunication, bad assumptions made by both sides, lack of clarity in messages sent, and misreading of messages received. They could not communicate effectively, and the overall overriding experience of all who took part was one of frustration. Full transcripts are available of their conversations.

**Solution Experience:** To provide the positive experience we have the enduser in the same situation as before, but whereas before they could only receive help through communication over an internet chat client, with a support who didn’t know the nature of the problem, nor how to solve it immediately, now we will have a person in the room beside the user, who knows the nature of the problem, and will step in when it most suitable to do so to help the user achieve what they want to do, but in a way that also helps to educate the user gain knowledge about the process want to apply. This is a user experience we imagine people would like if they had the need for some support.

So how can we evolve the current negative support experience to our ideal positive? And how can SAP move towards enabling such a process to it’s customers? It is not practical to have a support technician alongside the user. But is it possible to build software and support into a more integrated package that gives people useful, intelligent guidance that mirrors this experience to help them solve their issues? What ways can we provide and support the knowledge and feeling of empathy to do this on a 1 billion user scale?

Here, as an example, using what we have seen inside SAP AGS already, is an idea of what the current procedure could evolve to towards generating this user experience:

1) Customer encounters a problem/error
2) Customer accesses an bright, picture based support platform
3) Product user predictive software to find the problem and its solution
4) They enter a search for their problems (keywords etc)
5) The support database spits back related tutorial videos (SAP Connect, SAP Youtube channel-like) and related, simply-written KBAs, ranked by relevance
6) Peer support forums
7) If problem persists, customer accesses message solvers

Figure A.16: CFP Handout
Trinity Critical Experience Prototype

Stanford CFP

After talking with SAP, we have identified certain issues involving communication and collaboration between SAP service engineers and support representatives (The end user here is the SAP support personnel). The prompt also mentioned that improving next generation workspaces to increase collaboration and open communication channels would be a viable option to help in supporting 1 billion users.

We have seen that many people “hide” behind their large desktop monitor. This essentially acts as a wall blocking users off from others around them, enveloping them in their own world filled with their work which can inhibit collaboration, and ultimately lowers worker productivity.

By taking a large touchscreen monitor and creating a mount that allows it to convert from flush-mounted in a desk (essentially becoming part of the desk) to a traditional upright no, users can change from an open, collaborative environment to a traditional, more personal workspace at the touch of a button (or anywhere inbetween).

Scenarios for Screen Up vs. Screen Down

<table>
<thead>
<tr>
<th>Screen Up</th>
<th>Screen Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private information: emails, etc.</td>
<td>Sharing information</td>
</tr>
<tr>
<td>Working alone</td>
<td>Group meetings/discussions</td>
</tr>
<tr>
<td>General keyboard task: typing</td>
<td>Flat surface for writing/drawing/manual transfer of data</td>
</tr>
<tr>
<td>documents, data entry, etc.</td>
<td>Writing on the screen</td>
</tr>
<tr>
<td></td>
<td>General tablet tasks: web browsing, data viewing, etc.</td>
</tr>
</tbody>
</table>

User feedback shows that this prototype does open up the space for more efficient communication and collaboration. Users were also asked to focus on their preferred method to interact with the transitional mechanism.

- Users prefer either tapping, a button to press or a hand waving gesture. Some people mentioned that they like an adjustable slider to adjust screen position.
- Users also liked integrating screen position with sliding out a keyboard.
- Users did not like voice control, or a foot pedal.

Figure A.17: CFP Handout
A.4 Winter Quarter SGM Handouts

A.4.1 Dark Horse Prototype Handouts

Design Review Agenda:
1. New Direction
2. Focus of the Dark Horse
3. Prototype Idea
4. Results
5. Next Steps

New Direction
As a result of our TelePresence meeting at SAP over the break, we have defined a new direction. Our user is now the customer and our new problem statement is to enhance the low-touch support experience for the customer. By low-touch, we mean support for the masses, as opposed to hi-touch support for the smaller number of customers that receive close monitoring and guidance.

Focus of the Dark Horse
To enhance the support experience, there are multiple factors that we can investigate, including:
- Customer frustration
- Miscommunication of the problem
- Long wait times
- Black hole feeling

However, the largest problems we have seen point to frustration and miscommunication. From this, we thought, what if support could truly understand and empathize with the customer? This could alleviate those key issues, but how do you convey empathy? How do let support see what they see and feel what they feel? With these thoughts in mind, we decided this was our “dark” realm, and for our Dark Horse we want to focus on being able to sense customer emotion and to convey that emotion to support.

Prototype Idea
Using the same support-customer scenario as in our CEP, where a customer has to solve a MATLAB audio file by receiving help only from support who can only access Google Search. In the support ticket, the customer also selects their level of frustration and current understanding of the issue. This information is then relayed back to support. Our objective with this test scenario is to determine how the customer feels sharing this information and whether knowing that information changes the way support handles a ticket. After learning how emotion may play a factor in this interaction, we hope to sense and convey emotion through different mediums.

Results

Figure A.18: Dark Horse Prototype Version 1.0, page 1
Trial 1: Support receives client emotion in text form.

Support:
- Would like positive reinforcement. Knowing that she actually helped the client’s situation.
- Knowing customer is anxious may reflect on support. Support engineer may rush, miss certain things and thus be less productive.
- Initially appreciated knowing the customers emotion. Will get tiresome if she sees “frustrated” a lot.

Client:
- Felt a little awkward answering the emotional questions. “What’s the point? You don’t think the support person really cares.”
- Appreciated “Clear/Confused” option. Liked that he could share his understanding of the problem.
- Wished it was a faster process.

Trial 2: Support received client emotion in visual form.

Support:
- Did not really notice the wristband color. Acknowledged it, but it didn’t really affect him.
- Was more affected with his performance when the client explicitly told him she was on a time crunch.
- Tried to remain as calm as possible as frustration would lead him to become less productive.

Client:
- “(Support) was not asking good questions”
- It felt good to communicate a sense of urgency through emotion.
- Wished it was a faster process.
- Felt impersonal. Wish he has explained what he was trying to do vs. just telling her what to do.

Trial 3: Client receives support emotion in text form.

Support:
- Would feel slight pressure to put “Calm” because he wants to keep customer calm and assure him that he will solve the problem.
- Having some form of appreciation would help. “Like” button to show that his information was useful.

Client:
- It was interesting to see how support was feeling and if his message was getting through.
- Wished it was a faster process.
- When Support replied with “anxious” he felt worried that his problem was not going to get solved.
- Knowing Support’s emotion did not affect his behavior.

Next Steps

For the next steps, we plan to do more experiments with our prototype idea to gain more insight and feedback from the test scenario. We will also think about more improvements to our test.

Currently, the mediums through which we are conveying emotion are through a ticket answer through text, an LED wristband where a color matches a level of frustration, and an emotion wristband display. We hope to develop more input and output options and test them using our scenario. On the input side, we will test different methods such as facial recognition software, a brainwave scanner, a heart rate monitor and a blood pressure monitor. We want to enable support to know the real-time emotion changes of the customer. For the output side, we will test different methods to convey emotion changes, such as temperature changes on a wristband or other kinds of physical indicators.

We also are planning visits to SAP customers and an interview with Neil Greathead, who is head of Customer Experience at SAP to gain more insight into customer issues.
Design Review Agenda:
1. NeuroSky MindWave & Heart rate monitor
2. DHP Version 2
3. Trinity DHP
4. Next steps

NeuroSky MindWave & Heart rate monitor
From our previous DHP, a customer deliberately sharing their emotion did have an affect on the support engineer. We thought that we could take this experience up a notch where we could read the user’s brainwaves and heart rate to automatically determine their emotion.

- Procedure: Have subject wear brain sensor and heart rate monitor during meeting and visually observe to match emotions.
- Results: Brain sensor technology was not sensitive enough for moderate emotions. Data did not show any trend with emotion.
- Conclusion: Decided to re-evaluate whether this was the right direction in the first place due to CEP results.

DHP Version 2
Motivation:
- Our primary goal was to develop a way for support to empathize with the customer, and so we tried to answer the question: How can we make support feel as the customer feels? To do so, we thought of running a scenario where both individuals are in a partnership, where they have shared experiences.
- We also wanted to try to make the experience of support more fun, and added elements to convey that.

Procedure:
Again, we are using the scenario where a customer must solve a MATLAB script by reversing and slowing down an audio clip by receiving help through email communication with support who only has access to Google Search.

Both are told that they are given a time limit of 30 minutes and will be rewarded with a candy bar if they solve the problem. The time limit is to provide a sense of urgency and the candy bar is given as an incentive for them to perform the test. Adding in the shared aspect, where if progress is made (or not) to solve the problem, they are told that they will be given positive or negative consequences the same as their counterpart. This is to create a sense of partnership and shared experience between customer and support.

Figure A.20: Dark Horse Prototype Version 2.0, page 1
We will run 3 different scenarios:
1. Positive consequence given only
2. Negative consequence given only
3. Positive and negative consequences given

Positive consequences include:
- If the audio is slowed down, a party popper goes off to celebrate success and both are rewarded with a 1 minute chair massage.
- If the audio is reversed, a party popper goes off with colorful lights flashing to celebrate success.

Negative consequence include:
- If progress is not made through consecutive messages, a foam dart is shot at both of their heads.

With these tests, we are trying to answer these questions:
- Does having shared experiences induce empathy for the other?
- Does having shared experiences change behavior and make both parties more incentivized to work together?
- How do positive, negative, or both types of consequences affect behavior?

Trinity DHP: Mind Mapping

The idea of Mind Mapping is to solve mass volume support issues by linking customer actions on their computer to problems and frustrations. For example, repetitive clicking on a single button might indicate that an issue has occurred and the user cannot proceed to the next step. Here is a list of some possible parameters we can track:
- Speed of use
- Mouse pressure
- Mouse darting
- Changes in typing speed
- Excessive clicking
- Transfer from page to page

The common issues and frustration points can be detected and fixed by SAP support if the same behavior can be observed across a large number of users’ computers.

Next Steps

Our next steps are to actually run these tests in the next day or so and use the information to revise the scenario. We are also having a call with Neil Greathead Monday morning, who is head of Customer Experience at SAP to gain more insight into what customers say about SAP.
Design Review Agenda
1. Motivation
2. Vision
3. User Testing
4. Trinity DHP
5. Next steps

Motivation
In the previous DHP versions, we focused on emotion and shared experience as ways to convey empathy. However, we were unsure of where we could take those ideas, and took a step back to consider how else we could create an environment for empathy. What we ended up coming to was a previous idea we had last quarter - a support kiosk.

Vision
The support kiosk is a central location for help situated in the office building of an SAP customer or in a common area among multiple businesses. It has a touchscreen computer with full access to SAP support resources, including KBAs, notes, tutorials, etc. It is also a facility for quick and easy communication to support via message, phone, or video. The benefits of an SAP support kiosk may be:

- For the customer, it provides a vital resource in maintaining their systems and receiving efficient and centralized support.
- For SAP, it provides a presence of SAP in the customer’s office, demonstrating a dedication to service and support to their clients.

User Testing
User: Garrett, Tech Experience Level: Advanced

- Pros:
  - Didn’t have to explain as much because remote connection allowed support to see his problem.
  - “It was different and interesting”
  - Kiosk made him feel more prepared as it changed his environment.

- Deltas:
Would have liked view only and then allow support remote control only when needed.
Knowledge that session could be terminated at anytime.
Support person was too large. A smaller projection would be preferred.

**Next Steps**

We are going to run some more tests with our current prototype to gain more insight into user experience with the kiosk and its facilities.
- What size projection of support would be comfortable for the customer?
- What procedure of control privileges would be comfortable?
- Improve “touch” interaction and test effect on customer.


The theme for our dark horse prototype is addressing the issues of user frustration and support empathy. From our need finding and CEP activities, we’ve identified frustration and empathy as the major communicative weaknesses in the current SAP support community. With this in mind, we set about mapping the journey through an automated support robot that caters to individual personalities, technical abilities, time constraints and preferred support engagement. The ideal result for the dark horse is a uniform content user platform, where information and solutions are delivered in a clear, concise and user-preferred manner.

We also have another simplified support robot idea, which is a small portable version of the kiosk. The idea of this robot is to bring SAP support to the customer’s desk. The robot has two screens. One is on its head and for the video call, showing the camera feed on the support side. Another is on its body, showing some additional information that the support engineer wants the customer to see. The robot is connected to the customer’s laptop and has the ability for remote connection and

*Figure A.23: Dark Horse Prototype Version 3.0, page 2*
A.4.2 Funky Prototype Handouts

DHP User Testing

Test Scenario:
We had each customer solve a problem and receive support first at their own laptop and then at the kiosk to compare their two experiences.

Results:
- Telepresence made experience more engaging and personal.
- One user liked that support video did not take up his screen space.
- User more focused in kiosk and thought support was more legitimate.
- Remote connection was very useful.
- Prefer no headset - kiosk should have a mic and speakers.
- Distance to kiosk a barrier to use.
- Prefer if something could bring the experience to them.

Funky Prototype

Motivation:
Our goal in building the support kiosk was to create a more engaging support environment for the customer. By setting up a telepresence-like workstation, we wanted to bring a high-touch experience to the low-touch user. Through the user testing, we found that users were more engaged, but most of them acknowledged that they preferred to work on their own desk, and the distance of the kiosk was a concern. Thus, we wanted to develop something that could bring the features and experience of the kiosk to the customer’s desk - in the form of a support robot.

Vision:
- Compact support “Ro-Box” for storage and portability.
- Two screens - Body screen and pull-up head screen.

Meet Sal, Your SAP Pal!
• **Sal Mode (no video call):**
  ○ Head screen displays robot AI.
  ○ Body screen displays SAP-only support information and resources.

• **Support Mode (video call with AGS):**
  ○ Head screen displays camera feed of support consultant.
  ○ Body screen displays additional information that support consultant may share to the customer.

• Detachable keyboard for body screen.
• A greeting hand to start/end video calls.
• Connection to the customer’s computer for remote connection.

Steps to Version 2.0

- Finish CAD model of Body over the weekend
- LaserCAMM Body in Room 36 on Monday
- Assemble and integrate components by Tuesday
- Perform user testing by Thursday

Figure A.25: *Funky Prototype Version 1.0, page 2*
Problem Statement
An IT person who needs to efficiently collaborate with SAP Support to solve their problem at the convenience of their own desk.

Solution Statement
A tool for quick and easy communication with SAP that also provides a simple UI to support resources.

Why the Robox?
- How can we create an engaging support environment at the user’s desk?
- How do we want to achieve a seamless transition from self-searching mode to support mode?
- How can we simplify support to a “one button” concept?
- What software functions are necessary for support situations?
- How can we implement an AI into support?

Functions
- Pull-up head screen
  - Head screen stored in body and pulled up when needed.
- Pull-out keyboard
  - Keyboard stored in body and pulled out when needed.
- Video Support - Head screen
  - Head screen provides video chat support and AI (“Sal”) interface.
- Provide support resources - Body screen
  - Simplifies search of SAP support resources.
  - Provides remote viewing of Support Consultant’s computer

Features
- Portable
  - User can use it at any location.
- Engaging
  - Provides a support presence at the user’s workstation
User Testing
Our primary objective was to compare the experience of the Robox to the kiosk. Was the formfactor small enough for portability and convenience? Was it big enough to create an environment suitable for support? Were the screens useful for the support process?

One thing we learned so far is that the touch interface must be more appealing to use than the keyboard, otherwise our user would be more inclined to use their own computer. We are going to test our previous DHP users on a new scenario in receiving help to choose a restaurant for a meal.

The Road to Functional

Recent Benchmarking/Needfinding

- Problems arise because customers are doing something not considered “standard.”
  - complexity of implementation
  - customization
  - updates
  - customers get mad when “it isn’t SAP’s problem”
- Problems become more “how to” and less technical as things move into the cloud.
- Best Practices
- SAP Community Network (SCN) - Gamification

Figure A.27: Funky Prototype Version 2.0, page 2
As we mentioned in our previous findings, the best support is one that’s right there with you. In order to realize this, we want to create a tangible interface for remote collaboration. This led us to the ideation of a portal-inspired telepresence system with a shared table-top interface.

**Features:**

- **Personal space vs. Group space**
  - A key element in physical meeting spaces is that every participant has their own personal space (for notes, laptop, etc.) with a common focal point (the central area of the table) which is the group space.
  - Participants will have their own personal space which they can physically perform "sharing" actions. (e.g. moving a document from personal space to group space.)
- **Real-time “white board” table**
  - Participants will all be able to share real-time handwritten notes and drawings like they would be able to in a physical meeting space. It would mimic the feeling of sharing a physical whiteboard together.
- **Eye Contact**
  - Using a telepresence system, users can make “eye contact” commanding attention and engaging each other in the conversation.

Figure A.28: Functional Prototype Version 1.0, page 1
Additional portals
  ○ In the event customer and multi-department communication is required, there are additional portals that users can enter.

Benchmarking
  ● Spatial Partitioning: personal territory vs. group territory
  ● Four types of gestures: Point, Spatial, Kinetic, and Other
  ● Workspace Awareness: Consequential, Feedthrough, and Intentional Communication

TelePresence Tech:
  ● Direct eye contact alignment-create a real sense of presence.

Trinity Functional Prototype
A user interface and interactive search engine for solutions.

Many user issues already have documented solutions within the present support network. Primarily, current self-search functionality is only useful if you know your problem as defined by SAP. This prototype provides a means of obtaining the information users want in their own words.

Figure A.29: Functional Prototype Version 1.0, page 2
Road to Functional Version 2.0

- Embracing the notion of help being right next to you.
- Relaxing environment separated from your workspace.

Vision - SAP Booth

Features/Functions:

- Side-by-side video call
  - A side screen for video support to create the "next to you" feeling.
  - Most of time both customer and support engineer will look at the front screen and they can turn towards each other for face-to-face conversation.
- Foldable table
  - A table can be pulled out from the wall for customer to use.
- Front computer for system access and remote connection
  - When video call is not conducted, the front computer is used as an interactive search engine for solutions.
  - During the video call, customer can connect their laptop to the screen so that both parts can see the issue.
- Multi-degree adjustable chair
  - The chair is able to recline for relaxation.
  - The user can slide the chair forward and backward for a comfortable position.
● Hand gesture overlay
  ○ Relays image of remote partner’s arm/hand location to provide visual cues when communicating information.

System Diagram

![System Diagram](image)

**Figure 2: System Diagram**

**Next Steps**

**Benchmarking:**

- Interview with Warner Bros. tomorrow
- Interview HelpSU
- Observe interactions with Meyer Tech Desk and CS tutoring.

Figure A.31: *Functional Prototype Version 2.0, page 2*
Vision - SAP Portal
Our goal is to provide AGS and the IT technicians of SAP’s client companies with an efficient communication vehicle.

- Provide a centralized support portal for the customer
- Increase transparency of ticket statuses
- Innovate a more intuitive method of independent problem definition
- Create a natural interaction experience between IT and AGS

Customer Interviews

- Klaus Krug, Project Manager at Warner Bros. (MaxAttention)
  - Average of 10 on-site SAP employees
  - 3 weeks reduced to 3 days
  - Early human to human interaction
- Ron Grabyan, Data Warehousing Manager at SCE (Enterprise)
  - Getting a phone call is half the battle
  - Need better way to search the OSS Note system
  - Need more transparency and timely updates

Scope:
- The scope of this project will entail enhancing the support experience for SAP’s customers. Our focus will be on the needs of the client company’s IT technicians
and their wants from SAP's support department. We will not be focusing on security or access issues commonly related in confidential customer data. Our prototype provides the basic interface of this IT and AGS interaction. With this simple set-up alone, users have already found it to be much more natural and interactive versus the typical video-conferencing methods.

Functions
- Side by side video chat
- One-touch video call
- Record button
- Ticket bulletin board
- Screen sharing

Lessons Learned
- Could see motion but no cue beyond that.
- Left or right side did not matter.
- Preference to a screen more forward and at an angle.
- Users felt both obligated or not to look at the support consultant.
- Liked the separation of the screen (limits inattention).
- Execution of the physical interface (acoustics, positioning, etc.) will be extremely important.
- Felt more realistic.

Next Steps
- Coding interface software
  - Video call/Screen and video message recording

Figure A.33: Functional Prototype Version 3.0, page 2
A.5 Winter Quarter Brochure

**SAP**

**ENGAGE**

**Corporate Liaisons**
- Katharina Rock
- Tony O’Donnell

**Our Team**
- Kevin Burke
- Barbara Couto
- Michael McHugh
- Vinicius Serra
- Vinh Bui
- Yongbin Han
- Robyn Nariyoshi

**Team Coach**
- Vinod Baya

**Purpose**
How many times have you been put on hold, waited days to weeks for a reply, and endlessly rerouted by customer support?

**MISCOMMUNICATION - LONG RESPONSE TIMES - LACK OF UPDATES & TRANSPARENCY**

Whether it's by phone or ticket messages, customer support has a tendency to increase customer frustration due obstacles in communication.

_How do we redesign the support experience?_

**Background**
SAP is one of the world's largest software companies, providing enterprise software to help businesses manage operations and customer relations. SAP is looking to define how their support organization, Active Global Support (AGS), should evolve to serve an ever increasing number of users. To this end, it will be essential to scalably provide an accessible and seamless communication tool between customer and support.

**Vision**
Provide the business and IT users of SAP’s customers with an accessible telepresence system tailored to convey an engaging and efficient support experience.

**Requirements**
- Given:
  - Improves efficiency of customer support communications
  - Maintains or improves customer satisfaction
  - Scalable to 1 billion users

- Discovered:
  - Provides a centralized support portal for the customer.
  - Reassures customer that they are being helped.
  - Empathizes with a customer by creating a personable interaction experience.

**Side by Side Help**

**Remote Tech Support**
A customer can schedule an appointment with a support consultant to quickly diagnose and resolve the problem.

+ Both users can interactively share a remote desktop using the touchscreen.

A portable version of the kiosk, with a pull-up screen for video calls to AGS.

SAP Engage: Support at your side

Special thanks to the Stanford and Trinity teaching team and SAP for their continued support and advice.
Contact us at 310-sap-global@lists.stanford.edu
A.6 Winter Quarter Final Presentation Slides
- PROBLEM DEFINITION -
- MISCOMMUNICATION -
- LONG RESPONSE TIMES -
- LACK OF UPDATES & TRANSPARENCY -

How do we redesign the support experience?
“Need a better method to define our problems”

“Early human to human interaction drastically speeds up the resolution process”

Ron Grabyan, SCE
Klaus Krug, WB

VISION

Self-Service Support
Remote Support
Remote Support

- Communication
- Clarity
- Information
- Personable
- Connection
- Gestures
- Body Language
- Attention

3 weeks
3 days
**DESIGN JOURNEY**

1st Stop: Support Kiosk

- Dedicated environment for SAP service and support
- A one-stop solution terminal with all SAP support resources

**User Feedback:**
- Environment increases engagement and focus
- Users don’t want to walk too far

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**DESIGN JOURNEY**

2nd Stop: Robox Support Pal

- Portable version of the Support Kiosk
- Brings support to the user

**User Feedback:**
- Screen size matters
- Easy to be distracted
DESIGN JOURNEY

Current Stop: Support Booth

- Support consultant is right next to you
- Creates a more natural help environment
- Change remote tech support to a side-by-side conversation

DESIGN JOURNEY

User Feedback

- More realistic for help
- Users prefer a screen more forward and at an angle
- Visual attention cues are necessary