Web Assistance Technologies

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Web Assistance Technologies

With the growth of computer ownership and the Internet, more and more people turn to the Web for information, support and shopping. This provides an opportunity for Swisscom to offer customer support using Web Assistance Technologies. Web assistance software can solve customer problems in real-time, either supporting the customer service agent or interacting with the customer directly over the Web. Systems can respond automatically to simple customer text queries and emails, and can filter and route other emails to appropriate customer support agents.

The Programme "The Net-Centric Application Business" explores the opportunity for remote applications and application service providing models that result from the expected availability of broadband Internet access, both fixed and mobile, and the evolution of various end-devices for residential and business customers. With its Exploration Programmes, Corporate Technology is exploring telecommunication technologies and new service possibilities with a long-term view of 2–5 years. Further, the expertise built up in the course of this activity enables active support of business innovation projects.

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In today's deregulated market, competition encourages telcos to control costs, yet at the same time to enhance customer service. With this in mind, a recent Forrester report estimated the cost per customer phone contact at 30 US-$ and the cost per manually processed email at 10 US-$, while the estimated cost for web-based customer support was only 1 US-$ per contact [1]. Web assistance tools can solve customer problems and provide useful information, perhaps giving a full text answer to a typed question or engaging in an interactive dialogue (fig. 1). They can provide a user-friendly front end to a Frequently Asked Questions list (fig. 2). Potentially, they could match customer needs to Swisscom products, facilitating the sales process, and provide information, advice and support regarding Swisscom products.

By using Web Assistance Technology, support can be offered outside of office hours. Some problems can be solved automatically, while others can be escalated to the right customer service agent. Simple text queries and emails can be answered by software, while others can be routed to the appropriate person. During office hours, the same technologies can support the customer service agent, extending their range of competence, reducing training needs and minimising turn-around time for queries.

A customer interacts with web assistance tools in real-time through Java applets or online chat programs. Customers present their query in free text, a question for example, and the system displays helpful information in response, or asks pre-defined questions to focus the problem. By using the problem solving capabilities of web assistance tools to support customer service agents, novices and trainees can be guided to the right answer by software, reducing the need to escalate to more expensive subject matter experts. Experienced agents are left with more challenging problems and spend less time searching through documents to answer customer questions.
Corporate Technology has studied the techniques currently available for web assistance as well as the tools that can facilitate the development of operational systems. Site visits to tool manufacturers provided us with hands-on experience of relevant software tools and interviews with Knowledge Engineering consultants yielded useful insight into the practicalities of developing web assistance systems. We also analysed the relevant technical and commercial literature to identify the ways in which Swisscom can best use these technologies.

Processing Customer Input

Well known search engines such as Altavista and Google allow the user to type a phrase or question into their web browser and will respond by displaying a list of links to relevant web pages. Usually a technique known as the Bag-of-Words approach is applied. The web pages found will then contain the words of the entered question. Commonly occurring words, so-called stop words, for example "I", "my", "a", "with", "have", are filtered to make the search more efficient. From a Customer Service perspective, however, this simple-minded approach has severe drawbacks.

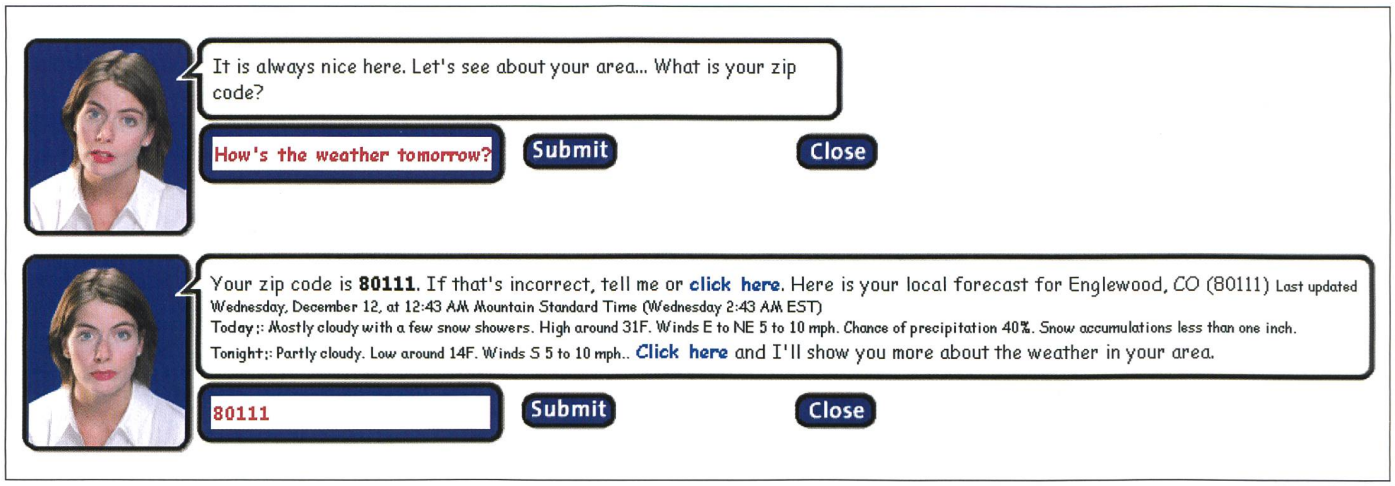

Fig. 1. An example of a commercial Question-Answering Web Assistance system delivering a full text answer and relevant links in response to a typed question. Additionally, the system is able to ask follow-up questions by itself, thereby establishing an interactive dialogue with the user.

One issue is that a phrase like "I have a problem with my mobile phone" will not match text such as "Problems with mobile phones" because to the computer the word "problem" is not the same as "problems" and "phone" is different from "phones". This is equally true in German, French and Italian, but fortunately a technique called stemming can solve the problem. Stemming is used in advanced information retrieval systems, for example Knowledge Management Systems, to reduce variant word forms to common roots. It is one of the simplest applications of so-called Natural Language Processing (NLP). For the English language, a widely used stemming technique is the Porter Algorithm, which uses machine-readable stemming dictionaries. NLP research and development for both German and French is ongoing [2, 3].
Another problem occurs when a relevant phrase or document does not contain the terms that are in the query text. In this case, the correct information will not be retrieved. This situation can be significantly improved, however, by using a computer-readable thesaurus to link words to synonyms (fig. 3). For the English language, for example, a thesaurus will associate words such as "difficulty", "error" and "problem". Customer input like "I have difficulty using my mobile phone" can now be matched more easily to "Problems with mobile phones". Spelling correction algorithms can also be used to prevent potential mismatch caused by misspelled words. Statistical approaches provide additional benefits. For example, the statement "I have a problem with my new mobile phone" may not match relevant information because of the word "new", even though the newness of the phone may not be relevant to the customer's problem. Statistical matching avoids this difficulty by measuring the goodness of each match [4]. The best matches can then be used to display a relevant webpage, provide a relevant answer based on an FAQ, perform a database lookup, or drive a decision support process involving question and answer.

Customer Problem Solving

Solving a customer problem will often require a series of interactions over the Web to obtain precise information to arrive at a solution. One of the simplest techniques for doing this is the Decision Tree. A Decision Tree is a collection of nodes where a question for the customer with a fixed number of responses can be associated with a node. Depending on the answer, a branch is made to a related node in the tree. The new node either contains the answer to the customer query or is a further question to ask. By repeatedly carrying out this procedure, the computer traverses the tree until the problem is solved. While Decision Trees are easy to understand and simple to implement, they do have the major drawback of sometimes containing redundant information. This occurs because identical decision-making logic can be embedded at different parts of the tree and consequently they can be time-consuming to build and difficult to maintain (fig. 4). What is needed is a way to represent knowledge so that it can be used to solve multiple problems and this provides a rationale for Rule Based Systems (RBS).
Rule Based Systems represent know-how by rules (fig. 5). A rule has the form "Conclusion/Action IF Condition" and may contain logical operators ("NOT". "AND", "OR"). By analogy with a Database, a collection of rules is known as a Rule Base. Unlike the Decision Tree, a rule containing know-how is not linked to a particular chain of events or even a particular problem. Rather, software known as an Inference Engine is responsible for using the rules to perform actions and make decisions. For example, customer text input can be processed using the Natural Language Processing techniques described earlier, until the "Condition" part of a rule is matched, then the rule "fires" and the "Action/Conclusion" part of the rule is activated. An action, for example, could be asking the customer a question to obtain more information or providing an answer to the customer. Conclusions/Actions can trigger other matching rules, allowing rules to be chained to perform logical reasoning. Because the know-how is only written once, rather than being embedded in different parts of a Decision Tree, the Knowledge Engineering needed to create and maintain a Rule Based System is typically much less than the equivalent Decision Tree.
A complementary technology known as Case Based Reasoning (CBR) represents knowledge as a set of cases, the so-called Case Base. Each case (precedent, prototype, exemplar, or episode) typically contains a description of a potential customer problem and its solution (fig. 6). CBR software finds relevant cases by matching the customer's input with the

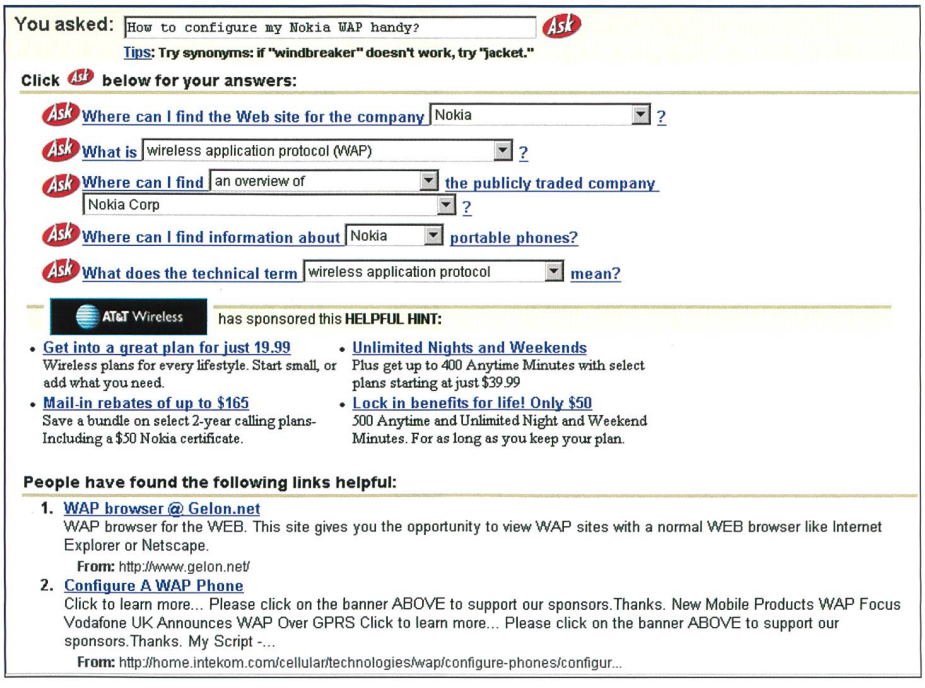

Fig. 2. An example of a commercial Frequently-Asked-Questions (FAQ) Web Assistance system. In response to the typed question "How to configure my Nokia WAP handy?" the system supplies the customer with a list of relevant questions taken from the FAQ. Clicking the "Ask" button delivers the corresponding answer. Additionally, automated recommendations to helpful links are provided.

cases in the Case Base. The most likely cases are retrieved and follow-up questions can be asked to choose between cases. When a case passes a pre-determined confidence threshold, the solution can be suggested to the customer.

Conclusions

Today, there are operational web assistance systems in diverse industries including computing, insurance and banking. Internet Service Providers (ISPs) are well suited to adopt this technology, as their customers are computer literate and have access to the Internet. But, web assistance tools are also suitable for other areas of telecommunications, encompassing both fixed and mobile networks. Customer acceptance will be critical for such systems and applications will need to be robust and useful to gain acceptance. Around-the-clock availability and convenience are major benefits from a customer perspective and will be an important driver for promotion of web-based support. In the longer term, expertise held in a Knowledge Base, either as rules or a case library, could become a powerful corporate resource for Swisscom.

Web Assistance Technologies offer a range of potential benefits:

- Empowering Swisscom customers to resolve their problems using the Web at the instant they need help by automatically walking them through targeted questions to pinpoint the best solution. The number of customers requiring support from a customer service agent would be reduced enabling agents to concentrate on the customers with the most urgent issues.
- Enabling novice agents and trainees to cover a much broader domain than would otherwise be possible and to successfully handle customer inquiries that would otherwise require escalation to more experienced agents.
- Cost-effective processing of the flood of email inquiries associated with Swisscom products and services. Intelligent routing would ensure that the right agent receives the inquiry and that they are supported by automatic access to customer information profiles and by a complete history of prior interactions.
- Automatic response to customer emails, escalating to customer support agents only where necessary.

Web Assistance Technologies can be used for diverse applications:

- Decision Support: "Which Internet access is best for me?"
- Diagnosis: "I can't get Outlook to work", "My phone is not working"
- Information: "How much is a Swisscom DSL connection?"
- Configuration: "I want to set up my PC for the Internet"

The technologies we have described can be used to support a customer service agent or can interact directly with the customer over the Internet. They can process text input from the customer such as email or "live" text from a chat program or Java applet and can use this input to solve customer problems. The software technology behind these systems includes Natural Language Processing and Knowledge Based Systems. When the two are combined together in web assistance tools, the customer can be offered around-the-clock support, seven days a week. Furthermore, the same knowledge-based technologies can be used to enable novice agents and trainees to cover a much broader domain than would otherwise be possible and to successfully handle a significant percentage of inquiries that would otherwise require escalation.

With regard to the processing of customer text input, tagging and stemming are effective approaches. Other useful techniques from Natural Language Processing include thesaurus (semantic processing), automatic spelling correction and statistical matching.

Rule Based Systems are a more efficient way to represent expertise than Decision Trees. Typically, less effort is needed to build and maintain a Rule Based System than the corresponding Decision Tree. Case Based Reasoning has emerged as a complementary technique and can be used on its own or integrated with the rule-based approach where appropriate. It offers an appealing approach to Knowledge Based System development due to the intuitive nature of cases as a knowledge representation formalism. In addition to the need to acquire domain (case) knowl-

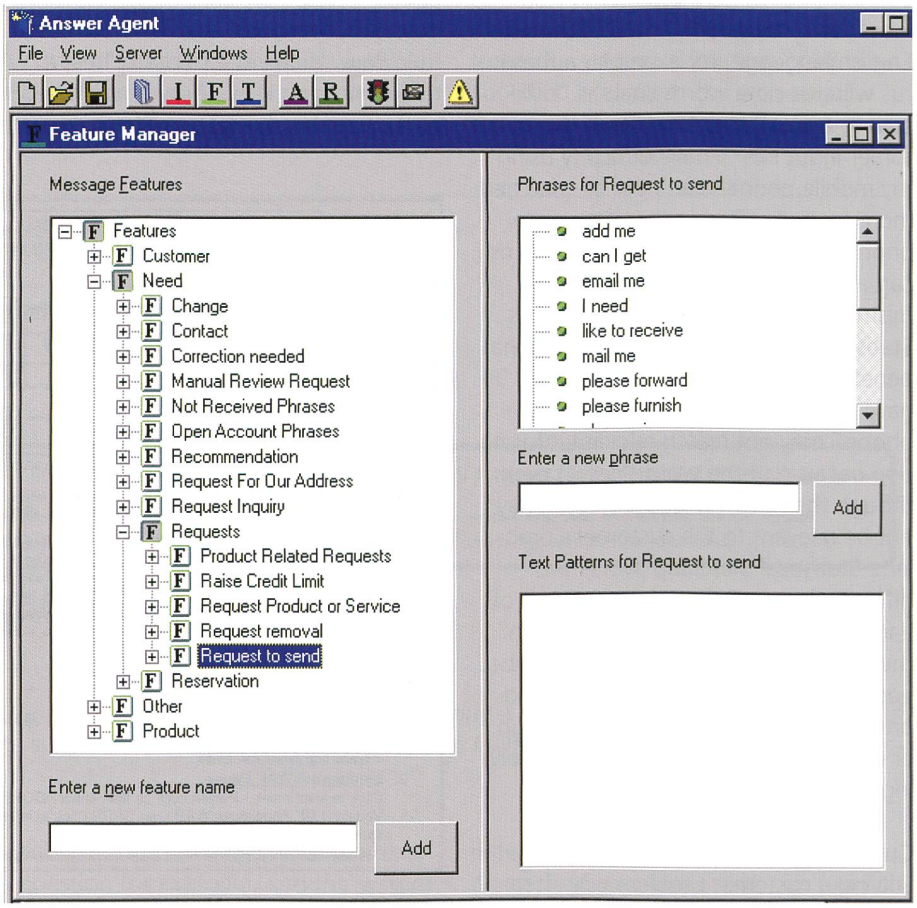

Fig. 3. A screen shot from a tool to set up semantic processing rules for customer text. Phrases such as "add me", "can I get", "email me", "I need", "like to receive", "mail me", "please forward" and "please furnish" are linked together as they typically indicate a customer request for information ("Request to send").

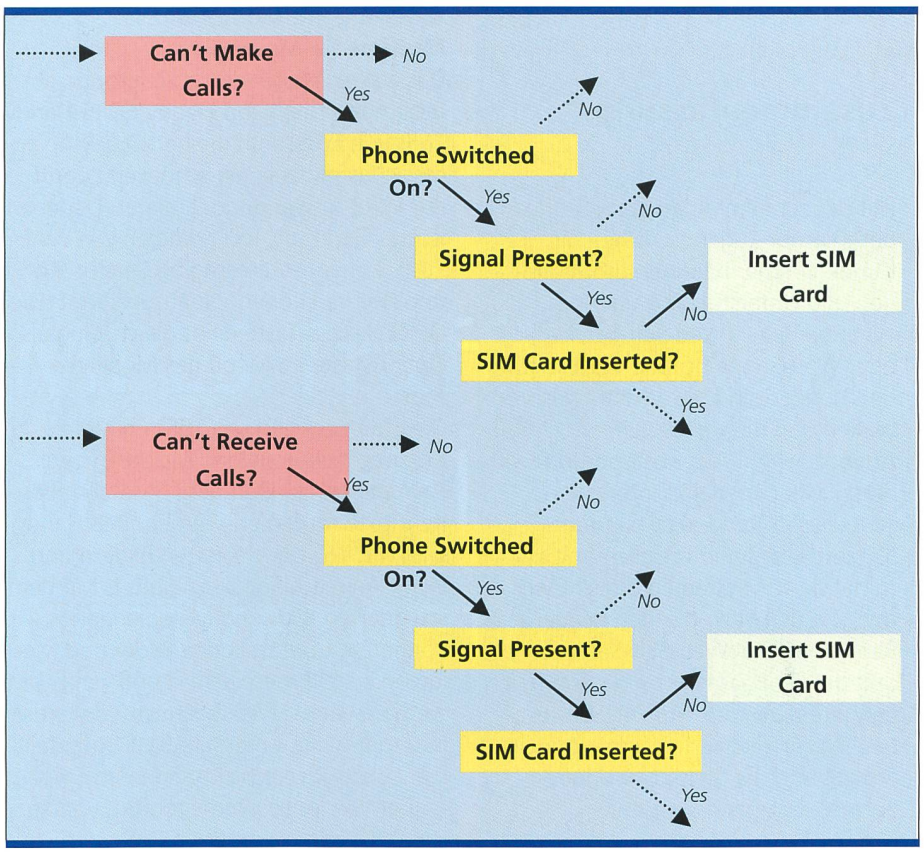

Fig. 4. Decision Trees represent problem-solving expertise (knowledge) as questions to ask the customer and as branches to be taken according to the answer received. Each branch leads either to another question or to a solution of the customer's problem. Web Assistance based on Decision Trees explores the tree from its root asking questions and branching according to the answer received until a solution is found. Note that in the example above, the two sub-trees "Can't Make Calls?" and "Can't Receive Calls?" use exactly the same decision-making procedure. Such duplication of information makes decision trees complex to build and maintain.

edge, there is a potential need to acquire vocabulary knowledge, retrieval (similarity/indexing) knowledge, adaptation knowledge, and maintenance knowledge before a system becomes fully operational. There is a variety of different methods for organising, retrieving, utilising and indexing the knowledge retained in past cases. Some systems retrieve cases based largely on superficial syntactic similarities among problem descriptors, while advanced systems use semantic similarities. The software for this should be able to handle large case libraries with retrieval time increasing linearly (at worst) with the number of cases.

Can't Receive Calls *IF* Communication Problem

Can't Make Calls *IF* Communication Problem

Communication Problem *IF NOT* (Phone Switched On *AND* Signal Present *AND* SIM Inserted)

Fig. 5. Rule Based Systems avoid the problem of information duplication (as found in Decision Trees) by representing knowledge as a collection of rules. The logical operators "IF", "NOT", "AND", link components of the rules together, enabling the computer to use logical deduction to process and solve the customers' problem.

Outlook

For maximum benefit from Web Assistance Technologies, Swisscom can take the following steps:

- Determine which customer service processes might best be automated.
- Identify where deploying Web Assistance Techniques can lower costs.
- Monitor the ongoing research and development for both knowledge management and web assistance techniques.
- Prototype potential tools and applications in the laboratory.
- Develop Knowledge Bases containing customer service expertise for relevant domains.

Natural Language Processing techniques continue to evolve and considerable Research and Development in Information Retrieval is currently underway [5]. In future, syntactic rules may be applied to analyse customer input using a set of language grammar rules. This will allow better processing of customer input enabling the component parts of a sentence to be identified for specific purposes such as database lookup. Machine learning is still something of a research issue, but techniques are being developed for automated and semi-automated approaches to acquire knowledge. Ideally, such tools will facilitate the initial acquisition of knowledge as well as its long-term enhancement. [5, 10]

Case:	Missing SIM Card
Symptoms:	Can't Make Calls Can't Receive Calls Phone Switched On Signal Present
Solution:	Insert SIM Card

Fig. 6. A simplified "case" example, linking symptoms reported by the customer to a potential solution.

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Marcel Reitmann *studied theoretical physics at the University of Bern and graduated in Quantum Field Theory in 1984. In 1986, he joined the Swiss PTT R&D department as a research engineer. During his long telecommunications career he has worked mainly in the fields of Network Performance and Quality of Service. Since 1997, he has been working in the areas of Customer Care and Customer Relationship Management as a research project leader.*

Zusammenfassung

Mit der zunehmenden Verbreitung des Internet-Zugangs suchen die Kunden immer häufiger Informationen und Unterstützung über das Web, benützen Web-Self-Services oder Web-Shopping. Die Vorteile für den Kunden sind die erhöhte Verfügbarkeit und die verkürzten Antwortzeiten. Aus Kostengründen muss Swisscom daran interessiert sein, diesen Trend aktiv zu unterstützen. Dies kann vor allem mit automatisierten Systemen erreicht werden, die den Web-Kunden bei der Benützung von Web-Self-Services und bei der Beantwortung seiner Fragen interaktiv unterstützen. Dieselben Systeme sollten ebenfalls zur Unterstützung der Swisscom-Kundenberater eingesetzt werden.

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Pointers

http://www.altavista.com/
http://askit.com/
http://www.ask.com/
http://www.rightnow.com/resource/casestudies.php
http://www.eassist.com/
http://www.google.com/
http://nike.ask.com/
http://www.rightnow.com/

Abbreviations

CBR	Case Based Reasoning
FAQ	Frequently Asked Questions
KBS	Knowledge Based Systems
NLP	Natural Language Processing
RBS	Rule Based Systems

GPRS-Jugendhandy für Multimedia-Messaging

Das auf eine jugendliche Zielgruppe abgestimmte Dualband-Handy GPRS-Handy T65s von Ericsson hat eine «Quick Access»-Taste, die einen schnellen Zugriff auf WAP-Anwendungen bietet. Daneben ist das Gerät mit Technologien wie WAP Push, Enhanced Messaging Service (EMS) und Picture Phonebook ausgestattet. Die Quick-Access-Taste dient gleichzeitig als Optionstaste im Menü des Mobiltelefons.

Die EMS-Funktion des T65s erlaubt es, in Kurznachrichten Bilder, Melodien oder Animationen einzufügen. Zusätzlich können Texte formatiert werden. Das Handy wird mit 76 vorinstallierten Bildern und zwölf Animationen ausgeliefert. Mit dem integrierten Bild- und Melodieneditor können am Gerät eigene Bilder und Melodien erstellt, gespeichert und verschickt werden. Längere Textnachrichten werden automatisch auf mehrere SMS aufgeteilt, die verkettet verschickt und beim Empfänger wieder zusammengefügt werden. Das T65s erlaubt es, über SMS oder WAP zu chatten. Dabei werden die Beiträge der Chat-Partner nacheinander auf dem Display dargestellt.

Das Handy speichert bis zu 300 Kontakte, die alle über die «Picture Phonebook»-Funktion mit einem Bild aus der EMS-Galerie verknüpft werden können. So erscheint bei einem Anrufer, dem ein Bild zugeteilt wurde, automatisch dieses Bild und sein Name am Display. Ein Kalender mit Weckerfunktion erlaubt die Verwaltung von Terminen. Kalender und Kontakte lassen sich über ein Datenkabel oder via WAP und SyncML mit Microsoft Office synchronisieren.

Das T65s verfügt über eine Datenübertragungsrate von 40,2 kbit/s. Ein kostenloser Software-Update auf 53,6 kbit/s wird 2002 möglich sein. Das WAP-1.2.1-Protokoll ermöglicht dem User, sich automatisch Updates von ausgewählten WAP-Seiten im «Push-Verfahren» auf das Mobiltelefon senden zu lassen. Das Handy hat ein sechszeiliges Display. Die Abmessungen betragen 105 × 49 × 21 mm. Das T65s hat Energie für elf Stunden Sprechzeit oder 300 Stunden Standby-Betrieb.

Quelle: pte-online
Homepage: www.ericsson.com