Implementation and role of device Management

Solutions to the End Users

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The implementation and role of device management solutions
To the End users.

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Abstract

This research is based on consumer complaints with respect to recently purchased consumer electronics. This research document will investigate the instances of development and device management as a tool used to aid consumer and manage consumer’s mobile products in order to resolve issues in or before the consumers is aware one exists. The problem at the present time is that mobile devices are becoming very advanced pieces of technology, and not all manufacturers and network providers have kept up the support element of End users. As such, the subject of the research is to investigate how device management could possibly be used as a method to promote research and development of mobile devices, and provide a better experience for the consumer.

The wireless world is becoming increasingly complex as revenue opportunities are driven by new and innovative data services. We can no longer expect the customer to have the knowledge or ability to configure their own device.

Device Management platforms can address the challenges of device configuration and support through new enabling technologies. Leveraging these technologies will allow a network operator to reduce the cost of subscriber ownership, drive increased ARPU (Average Revenue per User) by removing barriers to adoption, reduce churn by improving the customer experience and increase customer loyalty.

DM technologies provide a flexible and powerful management method but are managing the same device features that have historically been configured manually through call centers or by the end user making changes directly on the device. For this reason DM technologies must be treated as part of a wider support solution. The traditional requirement for discovery, fault finding, troubleshooting and diagnosis are still as relevant with DM as they are in the current human support environment yet the current generation of solutions do little to address this problem.

In the deployment of an effective Device Management solution the network operator must consider the integration of the DM platform, interfacing with many areas of the business, supported by knowledge of the relationship between devices, applications, solutions and services maintained on an ongoing basis.

Complementing the DM solution with published device information, setup guides, training material and web based tools will ensure the quality of the customer experience, ensuring that problems are completely resolved, driving data usage by focusing customer education on the use of the wireless service.
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In this way device management becomes a tool used both internally within the network or device vendor and by the customer themselves, with each user empowered to effectively manage the device without any prior knowledge or experience, confident that changes they apply will be relevant, accurate, stable and compatible.

The value offered by an effective DM solution with an expert knowledge service will become a significant differentiator for the network operator in an ever competitive wireless market.

This research document is intended to highlight some of the issues the industry faces as device management technologies become more prevalent, and offers some potential solutions to simplify the increasingly complex task of managing devices on the network, where device management can be used as a tool to aid customer relations and manage customer’s mobile products in order to resolve issues before the user is aware one exists.

The research is broken down into the following, Customer Relationship Management, Device management, the role of knowledge with the DM, Companies that have successfully implemented device management, and the future of device management and CRM. And it also consists of questionnaires aimed at technical support agents and mobile device users. Interview was carried out with CRM managers within support centre to further the evidence gathered.

To conclude, the document is to consider the advantages and disadvantages of device management and attempt to determine the influence it will have over customer support centre, and what methods could be used to implement it.
1. Introduction

The wireless world is becoming increasingly complex. Features that were once only available on high end devices are now available on entry level phones, while a new breed of ‘Smart phone’ devices are creating previously unseen customer support issues. The cost of subscriber ownership for a Network Operator is rising as revenues move from a voice-centric model to one fuelled by new and innovative data services.

“With the increasing complexity of the wireless world, we cannot expect our customers to configure their own mobile devices. We need to be able to identify potential problems before they happen and supply the latest software updates to increase levels of customer satisfaction”

A range of new platforms are emerging in the field of ‘Device Management’. This research explains how the application of these technologies coupled with effective management of knowledge around wireless data can reduce the cost of support for new wireless devices and provide market drivers for data services, removing barriers to adoption and increasing customer satisfaction.

3rd Generation of mobile phone

Figure 1.01 3rd Gen. Mobile phone
The problem at the present time is that mobile devices are becoming very sophisticated pieces of technology, and not all manufacturers and network providers have kept up the support element for the End users in mind.

Many customers are faced with uncertainty and confusion when purchasing such products, and even after purchase, are unsure of how to use these devices to their full potential.

The aim of this research is to investigate how device management could possibly be used as a method to promote research and development of mobile devices, and provide a better experience for the consumer.

Below shows the third generation device structure module that explains the diagram in the fig 1.01 above, which will help us understand the complexity, functionality of the device.
Research Background
Research on mobile technologies has been in place for a number of years now. Some of the texts studied for secondary research have provided a lot of answers to quite problematic questions. These texts, although over ten years old, are still relevant today, even though they do not match the technology available. This is due to the social impact of the mobile phone. It has been interesting to note the predictions made ten years ago, and how accurate they have proven to be.

This is also relevant to modern texts. New predictions are being made, and it shall be interesting to see how valid they are when compared with the next generation of mobile devices.

One of the texts researched up to this point which has some of the most accurate predictions was written by Frances Cairn cross in 1997. Titled “The Death of Distance”, she raises very interesting points on customer support, and how people will begin to expect more sophistication in their mobile devices. Her predictions for then-future technology have been surprisingly accurate. Howard Rheingold, in 2002, also wrote a text entitled “Smart Mobs: The Next Social Revolution”. Within it, he confirms a lot of Cairncross’ original predictions, and makes a few of his own. There will be more about these two authors among others later on in the report.

Dissertation Objectives
The aim of this research is to determine how DM solution is implemented to help aid the customer, which comes as a new standard of mobile device support, will affect the implementation and maintenance of Customer Relationship Management (CRM) in technical support centers for mobile technologies. It is important at this stage to note that mobile technologies, does not refer purely to mobile phones, but to any cellular device- including, but not limited to the mobile phone, data-cards, mobile modems, and other GSM/GPRS/3G/HSDPA/HSUPA enabled technologies,

This aim will be met by achieving the following objectives:

- Research into past mobile technologies, and their impact on society
- Research into what technologies are available today, and the current level of support offered by various organisations
- Research into DM, and instances where it is already implemented
- Surveys of users of mobile devices
- Surveys of technical support agents
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• Interviews and data gathering with various staff members from WDSGlobal – a leading mobile and wireless communications technology organisation
• Analysis of all primary research and data gathered
• Conclusions

There have been plenty of studies into mobile technologies, and their impact on society to date. There have also been many studies on how C.R.M should be implemented in an organization. There has not, however, been a lot of research into how DM solutions affect C.R.M, and so the objective is to address this point.

Research Constraints
Constraints of research are given in all subjects. There will always be a line that cannot be crossed, names that cannot be mentioned, and details that must remain confidential. This report is no different.

Some of the technologies under development in the mobile world are still confidential, and are not ready for the public domain. Names of certain people at certain organizations also must be kept confidential for privacy reasons. These technologies may be referred to in an anonymous manner throughout the report.
2. Research Method

Introduction
Research into the current state of the mobile phone market, how the user interprets mobile technology, their competence with it, and at what level DM solutions are implemented to improve customer relations is a central point to this research. It is important to note how the trend in mobile communications has changed over the last decade, and how it is predicted to change again. There will be analysis into what current procedures are in place within technical support centres, and what future methods are going to be implemented to incorporate the shifts in technology.

This in turn will determine in what ways customer support has changed over the past ten years.

Throughout the research, analysis will be made of many different research techniques, but there will be a primary focus of what Saunders et al. (2007 pg.102) refers to as the research ‘onion’ – a set of layers through which a course can be made to achieve overall data collection and analysis.

Role of the Researcher
The author of this research document worked at WDSGlobal for a contract placement year. Over this period of time, he became experienced with mobile technology, and how to support it over telephone or email conversations.

As an employee, it can be argued that the author has a biased view towards the views of the technical support agents, and may tend to agree more with their opinions than the end users.

This view has been combated by conducting research of the mobile device users in the form of a survey. Details of this survey are available within the Research Strategy. These results will be analyzed, and compared with the results of the interviews carried out.

Research Philosophy
Before determining how this research will be done, it is important to plan how it is to be achieved. It would not do to gather as much data as possible and try to work out a rationale without a clear indication of what it is that is being looked for.

For this reason, it has been necessary to look into some research philosophies. Saunders et al. (2007 pg.101) defines research philosophy thusly;
The overarching term relates to the development of knowledge and the nature of that knowledge. At first reading this sounds rather profound. But the point is that this is precisely what you are doing when embarking on research – developing knowledge in a particular field.

Miller (1991 pg.71), takes a slightly different approach to research philosophies. He states;

An applied research design must be able to interpret behavior embedded in a complex social system. The researcher begins by trying to conceptualize the parts of the system under investigation, its boundaries, and its interface with other systems, the feedback loops, and other subsystems to which it may be connected.

After looking into both theories, it was decided to remain with Saunders et al.’s (2007) ideas. Their work incorporates the views of other well respected researchers, and they are often referenced within the text. Other author’s opinions will be mentioned throughout the report.

Throughout the research, the author will be undertaking the “Interpretivism” epistemology, as defined by Saunders et al (pg.106);

Interpretivism is an epistemology that advocates that it is necessary for the researcher to understand differences between humans in our role as social actors. This emphasises the difference between conducting research among people rather than objects such as trucks or computers.

As the research will involve two specific sets of sample groups: - the technical support team, and the general public users, it is important to recognize each of their roles, and the differing levels of technical ability.

Research Approach
An expected outcome, theory or hypothesis has thus far not been set, insofar as the author assumes that DM will be an aid to an organization that will help to reduce costs, and increase the level of customer satisfaction within it.

As such, the researcher will be taking a more “Inductive” approach – i.e. building theory based on the results and outcomes of the research undertaken, and the primary data gathered. Based again on Saunders et al.’s research ‘onion’ (pg.102), they define inductive research as follows;

The purpose here would be to get a feel of what was going on, so as to understand better the nature of the problem. Your task then would be to make sense of the interview data
you had collected by analyzing those data. The result of this analysis would be the formulation of a theory.

This has been a maintained research approach throughout the document – to analyze the present and past state of customer support in a technical environment, and acknowledge how it could be improved by the introduction and implementation of DM.

There is, however, an expected outcome, as aforementioned, that DM will be a useful tool for customer support. For this reason, there will also be an element of “deductive” research, and the strategies that would follow such an approach.

**Research Strategy**

As the research is including elements of both an inductive and deductive approach, it has been decided, again following the Saunders et al. theories, to utilize what is known as the “Grounded Theory” (pg.142).

In Grounded theory, data collection starts without the formation of an initial theoretical framework. Theory is developed from data generated by a series of observations. These data lead to the generation of predictions which are then tested in further observations that may confirm, or otherwise, the predictions.

There will also be a “Ethnographical” element to the research. Having worked within WDSGlobal in the past, the author has been immersed within the world of mobile technology over the past year. Even during this short time, it has been possible to see how technology has changed.

A brief meeting was arranged with CRM manager & DM term leader. Which role was to establish the quality of the overall product and see it fit for consumer use? Through their guidance and support, it was decided to pursue DM as the theme for the research document.

These interviews will provide plenty of qualitative data. Conflicting reports from these interviews are expected, along with differing opinions on user competence and expectancy of mobile products, and the customer support expected by the user. All interviews will be noted and critically analyzed and compared to leading theories before any final conclusions are made.

The research will involve a deductive element in its approach. To support these theories, it will be necessary to conduct research into the consumer market. It is a well-known fact that many people in the UK now own a mobile communications device. It is intended to create a survey to gain quantitative data, which can then be compared and contrasted with the interview results. It can then be seen how they differ from what the leaders of the mobile phone field think. It is yet to be decided whether this will take place by asking mobile phone users on with issues on air, or by other means,
It may also be decided to send the survey via a separate format to the some agents on the technical help desks. This will enable differences between what customers expect from a technical support centre, and what the support centre is able to provide to the customer to be highlighted.

**Time Horizons**

The next step within Saunders et al.’s Research Onion is to look at the Time Horizons. Of the two types that they describe, cross-sectional and longitudinal, it is likely that the research conducted will be refined to the former.

By undertaking this approach, it allows analysis of the timeline of DM and comment on all the major points, thus allowing accurate predictions of what is to come.

**Reliability and Validity**

It is vital to this report that consistent results are collected as a result of the surveys and interviews carried out. Without such consistent results, the reliability of the data is thrown into doubt.

Easterby-Smith et al. (2002 pg.53) have concluded that there are three basic questions that must be answered to an acceptable standard to ensure that the gained results are reliable;

- Will the measures yield the same results on other occasions?
- Will similar observations be reached by other observers?
- Is there transparency in how sense was made from the raw data?

It is also in the researchers best interests to reduce the threats to reliability, and ensure that all data and conclusions made from such data are of a valid nature. Saunders et al. (pg.149) quotes Robson (2002) as identifying four main threats to reliability;

- Subject or Participant error
- Subject or Participant Bias
- Observer Error
- Observer Bias

It is unlikely that Subject or Participant error or bias can be ruled out, no matter what safeguards are put in place. The extremities of such errors and bias can, however, be managed.

By keeping interview questions open, and not narrowing down the choice of responses the interviewee can give, an open mind can be maintained getting the most truthful answers possible. The same principle can be applied to the surveys that will be undertaken.
Observer error is something that the researcher must be aware of. To help reduce the chances of error, a strong and rigid structure for the research must be maintained.

In the final case, Observer bias, the researcher may succumb to personal thoughts or feelings to reach a desired outcome, rather than the truthful one. It has already been mentioned that this will be combated through the different variety of research techniques in place.

3. Literature Review

The Advancement of the Mobile Phone and its Impact on Society

The first line of Rheingold’s (2002) book sums up what is happening in today’s society. The mobile phone is becoming more and more a part of every day life, and there seems to be no end to the potential these small devices can reach. To quote Rheingold (2002 pg. xi) himself:

The first signs of the next (technological) shift began to reveal themselves to me on a spring afternoon in the year 2000. That was when I began to notice people on the streets of Tokyo staring at their mobile phones instead of talking to them.

Cairncross (1997 pg. 1) made the prediction ten years ago that “in time, it will be no more expensive to telephone someone on the other side of the world than to talk to someone in the house across the street.” Time has since proven her correct. Mobile applications such as Skype and Fringe have been designed to enable “Voice over IP” (VoIP) through a 3G or HSDPA data connection. This technology has the power to make network operators redundant, and increase the communication capability of the individual.

The growth of the mobile phone in particular, and its future role in society was also beginning to be recognized. Cairncross (1997) also predicted how modern business would grasp this new technology, finding ways to keep its employees in twenty-four hour contact. Through the advent of mobile internet, mobile office programs, and the ability to receive office email on a handset, it is becoming difficult to “escape” from the workplace. As Cairncross (1997 pg.7) says, “The mobile phone thus raises productivity by using previously idle time.”

Device Management’s success, therefore, becomes all the more important, as mainstream businesses become dependant on mobile communications.
What is Device Management?

In recent years Device Management (‘DM’) has become a commonly used term within the Wireless Industry, which broadly describes a range of technologies used to manage features of the device. 

*Mobile device management* is a protocol tool intended to distribute applications such as Data/configuration settings, Firmware updates, Optimize the functionality and security of device network, Minimize cost and downtime, to provide a better experience for the customer.

A useful overview is provided by the Open Mobile Alliance:
"The goal of the Device Management Working Group is to specify protocols and mechanisms that achieve management of mobile devices.

Management includes:
- Setting initial configuration information in devices
- Subsequent updates of persistent information in devices
- Retrieval of management information from devices
- Processing events and alarms generated by devices

In the scope of Device Management, information includes (but is not limited to):
- Configuration settings
- Operating parameters
- Software installation and parameters
- Application settings
- User preferences

The Device Management Working Group defines management protocols and mechanisms that enable robust management of the life cycle of the device and its applications over a variety of bearers."

DM allows remote management through device updates and the ability to query a device – enabling diagnostics and a mechanism to fix problems. This two-way management allows the managing authority (typically the network operator or manufacturer) to change the configuration of the device at any time and gain new insight into devices in the field for troubleshooting and reporting network performance information.
Types of device management.

OMA
OMA DM is an open standard defined by the Open Mobile Alliance (OMA). This describes a method for a server and device (client) to communicate using the SyncML synchronization protocol to update and execute management objects on the device. The goal within the OMA DM working group is to standardize the management method across all devices, so an investment in a single OMA DM server can be leveraged across all devices on the network. Many device manufacturers have started to build OMA DM clients into their devices.

An OMA DM client exposes aspects of the device as a ‘Management Tree’. This represents a hierarchy of objects that can be queried, modified and executed by the DM server. Access to this
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management tree is defined through a security mechanism allowing multiple servers or management authorities to manage the device, each with unique security privileges. Before a device can be managed through OMA DM a bootstrap process would normally take place. This is an OTA client provisioning message that defines the access rights for a trusted DM server. Once the bootstrap provisioning has occurred the DM server can manage the device through a ‘continuous provisioning’ model over a TCP/IP based bearer. An OMA DM server will not provide management of devices without an OMA DM client integrated on the device.

What can be managed with OMA Device Management (OMA DM)?

Each node in the OMA DM device management tree can contain a value or may contain sub-nodes forming a tree. OMA DM has defined a number of mandatory and some optional standard management objects which expose common device attributes through a standard interface. Top-level management objects contain standardized information about the device, such as the manufacturer name and device model. Device-specific information may be placed in extension nodes allowing each vendor to expose additional information without breaking the standard. By manipulating the management objects, an OMA DM server can change any exposed device setting, such as the IP address of the GPRS gateway or IMAP server.

Using the Firmware Update Management Object (FUMO), an OMA DM server can inspect the firmware version and currently installed updates as well as transfer and install additional firmware updates. The OMA DM protocol does not specify the type of the firmware update images and thus leaves enough room for differentiation and competition for the most efficient delta algorithm and patch mechanism used to update the device. However, OMA DM establishes a standard protocol for downloading and installing the updates which enables OMA DM vendors to concentrate on building the best server solution rather than having to support each individual update mechanism.

OMA: open mobile Alliance; this describe a method for the server and the client device to communicate using the SyncML synchronization protocol to update and execute management object on the device.

When configuring through WAP Push, three components

- the Short Message Service (SMS) Router,
- Push Router,
- Configuration Manager

All work together to configure the device.

This section describes how Windows Mobile handles device configuration at the various component levels. The following diagram illustrates the architecture for device management through over-the-air (OTA) device configuration using the WAP Protocol.
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Figure: 3.02 Diagrammatic explanation of the functionality of OMA over the air.

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1. The Short Message Service (SMS) Router receives the incoming SMS messages from the network and determines the final destination for the message.
2. The SMS Router delivers the message to the appropriate software component on the device for processing. SMS messages move from the SMS Router to the appropriate layers of the Wireless Application Protocol (WAP) stack. The SMS Router is designed to route messages to one client per provider.
3. The WAP component decodes the WAP push message and sends it to the Push Router.
4. The Push Router accepts and processes push messages from a Wireless Session Protocol (WSP) push source.
5. When the Push Router receives a new message, it is forwarded to the Security Module for authentication and role assignment. After the Security Module processes the message, it sends the message back to the Push Router Core, and the Push Router Core routes the message, which is a configuration request that is encoded in an XML document format, to the Configuration Manager. For more information, see Push Router, and Routing Messages for Mobile Operators, and Security.
6. The configuration manager is the hub of activity for over-the-air (OTA) configuration, downloads, and configuration updates generated by the local applications. This single point of configuration processes a configuration request internally, enables configuration security to be enforced, and enables the control mechanisms to avoid configuration conflicts. The configuration request is encoded in an XML document format. Configuration Manager accepts XML configuration requests from the Push Router.
7. Configuration manager routes the command to the specific Configuration Service Provider. The Configuration Service Provider processes the command and sends processing result back to the Configuration Manager.

Firmware update

An overview of Firmware Over The Air [FOTA] update.

Firmware update platforms provide a mechanism to modify the firmware image within the device over-the-air. This provides a path to fix software bugs or add new features without the need for a device return/re-flash process. A firmware update platform will typically require a client installed on the device.
The platform often consists of a publishing engine – where the device manufacturer can release new firmware versions and a delivery mechanism to distribute updates to devices. A layer of business logic provides an approval process to release new device-builds to the delivery system. The firmware update mechanism typically uses ‘differential update’ technology to create a very small and bandwidth efficient update package. This is constructed by comparing the old and new firmware images, and only marking the bits that have changed. A fault-tolerant delivery mechanism then ensures that the package is delivered and error-checked before installation.
Over the past decade, several mobile device have undergone various transformations from relatively simple voice based handsets to more sophisticated multimedia communication devices, these includes MP3 players, cameras, internet web browser, conferencing. To combat these increasingly complex features the device requires a complex firmware. It is this firmware that controls the operation of the phone; these complexities discussed above present a serious challenge to mobile phone users, manufacturers and network operators. It is important to update your phone to the latest version to improve device performance as well as fixing known bugs and problems from the previous version.

The main issue which I found out that needs improvement is the updating of the firmware in the device without taking the device off line. Due to latest treat on our modern world today it became apparent for devices to be online basically all the time, the reason are incase of emergency situations. For devices produce before now, when devices is been updated is most reboot and this practice is not healthy for business and for emergency purposes, that was why this practice should be implemented. This practice is presently in use in Wds Global and some network operators and vendors. Below we explain the functionality of FOTA and its latest improvements.

**FOTA** is an acronym for Firmware Over-the-Air. It is used for upgrades to mobile phones and PDAs. Firmware updates are a cost-effective alternative to handset recalls as a way to fix software bugs, slashing the repair costs to a fraction and avoiding the bad press associated with a public recall. It is also an extremely efficient technology for offering new features and services to subscribers.

With a simple push of a button or remotely triggered, the mobile device connects to the server that analyzes the device, checks its configuration and software version, automatically selects the appropriate software update for that particular device and then remotely downloads and installs the update. Software patches are small, typically three to five percent of the original software, and require only a few minutes to transfer.

Normally you have to go to a specific service center (every mobile brand has their own) to get a firmware upgrade. Or some phone models can be upgraded by connecting your phone via a cable to your PC. But both methods are considered inconvenient by consumers and also depend heavily on consumers to seek out the upgrade, and therefore the majority of mobile phone manufacturers and operators have now adopted FOTA technology for their handsets. If the mobile phone has FOTA capability, you can instead download the firmware upgrade directly from your mobile phone service provider. It also allows manufacturers and operators to "push out" firmware upgrades to ensure that mobile consumers have the latest software improvements, which helps reduce customer support costs and increase consumer satisfaction. The process typically takes between 3 and 10 minutes, depending on the size of the upgrade file and the speed.
of your wireless connection. By 2008, the firm forecasts that 50% of all handsets shipping will be FOTA-enabled. Of that figure, most mid-range and high-end handsets shipping will be FOTA-capable, in addition to a few low-end devices.

A windows mobile powered device does not have a single firmware, but instead has a ROM regions segment into different ROM packages that can be individually updated. Over–the–air (OTA) firm ware update is a way to update the ROM packages in the device by using the update image technology and open mobile Alliance Device management (OMA DM).

**OMA DM** specification is designed for management of small mobile devices such as mobile phones, PDAs and palm top computers. The device management is intended to support the following typical uses:

- **Provisioning** – Configuration of the device (including first time use), enabling and disabling features
- **Configuration of Device** – Allow changes to settings and parameters of the device
- **Software Upgrades** – Provide for new software and/or bug fixes to be loaded on the device, including applications and system software.
- **Fault Management** – Report errors from the device, query about status of the device.

All the above functions are supported by the OMA DM specification, and a device may optionally implement all or a subset of these features. Since OMA DM specification is aimed at mobile devices, it is designed with sensitivity to the following:

- Small foot-print devices, where memory and storage space may be limited
- Bandwidth of communication could be constrained, such as in wireless connectivity
- Tight security, as the devices are vulnerable to virus attacks and the like; authentication and challenges are made part of the specifications.

**Improvement of OMA over the air (FOTA)**

A new innovation from Red Bend Software in collaboration with wds Global called Background Updating enables consumers to update the firmware in their mobile phones in the background while retaining full use of the phone and without taking the device off-line.

In the past and on some devices you will find out that when carrying out an update of the firmware you must have to reboot and restart the device, over and over after the installation of firmware update, but now they is a hope for a new beginning, which is the OTA Firmware background update.
This is a process of updating the Firmware in the mobile phone in the back ground where the user is using the device with out taking the device off line. In the past when you perform an update on you mobile phone the client will accept the firm ware update and then the phone will reboot, while apply the update ,this hinders the user from using the phone for about 2-14 min depending on how long the update will take. This is related to how much changes are been made to the soft ware, the phone needs. The is use for updating the firmware for maintenance releases or delivering soft ware improvement after they purchase the phone, million of user apply this technology (FOTA UPDATE), and is done with out taking the device offline update. Operator likes this technology for various reasons e.g. emergency reasons in the US, businesses, security.

The update can be done on any platform e.g. windows, Mac, Linux and more for applying the latest firmware update. When doing the FOTA update you can as well make a call if they is any emergency situation. During the updating it compares the versions of firmware and extracts only the essential differences. So what is sent over the wireless network is just the change’s that take place from the 1st version to the 2nd version. In the process of updating it will ask “accept update” and when you clicked Accept , instead of rebooting and going off line, it says you can continue using your device, and still in the process of updating you can make call receive call send Sms video messaging use the browser ,and do any thing you usually do with your device. Below is a pictorial representation of Background Updating without taking the device off-line.

Figure: 3.03 Background Updating without taking the device off-line.
The above fig shows devices are been updated and still in the process we can make calls and receives sms, emails and do ever thing we normally do on our device.

What is the advantage of applying this technology in DM? And does it have any disadvantages?

Advantages of background updating without taking the device offline are quite numerous.

- National security
- Healthy Emergency
- Crime Emergency call
- Important business transaction

At present no disadvantages has been found yet and the process work fantastic.

Knowledge delivery platform

An often overlooked aspect of device management is the delivery of setup guides, tutorials and training to the user.

DM provides a mechanism to essentially guarantee that, barring hardware fault or transient network issue, the device is known to be working. This means that in the main any support calls are due to a lack of user education or experience.

By serving correctly positioned knowledge to the device in the form of self-help applications or product training it should be possible to reduce the number of these calls, and hence the customer support cost.

The delivery of appropriate knowledge may also provide a near-term solution where certain DM technologies will not be widely available due to the lack of penetration of suitable devices. Most of what can be achieved with a device management platform can be also be achieved by the customer if provided with the correct knowledge or instructions.

Integrating knowledge into the solution

The knowledge service provides a resource for all processes within the device management solution based on the most current device and network service information available.

Through the use of ‘Web Services’ this knowledge can be integrated into public web sites, customer portals, CRM tools within the contact center and even on the wireless device itself.

Knowledge could be offered through a range of mediums:

- Web based wizards to manage configuration changes
- Accompanying setup guides and instructions for call center agents
- ‘Do no harm’ rules engines
- Web based training and tutorials for end users
- Troubleshooting and fault diagnosis tools
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Providing well placed knowledge tools will also reduce the requirement for on-going training of customer facing staff to deal with support issues. This offers a particularly attractive option where attrition is high.

Smart Card management
Although normally associated with service provisioning, the smart card or SIM (subscriber identity module) management platform will often play a roll in the Device Management solution. Events within the smart card management platform will often form the trigger for DM events, and certain changes on the device may require updates to the service provisioning on the smart card.
Some management activities may actually originate on the smart card – such as the installation of data connection settings when a new card is inserted into the device.

Client Provisioning
OTA provisioning, often referred to as ‘Client Provisioning’ was one of the first device management tools to be widely available for the modification of configuration settings and service parameters directly on the device.
A variety of client provisioning mechanisms are available across multiple wireless bearer technologies, and are used to configure a range of features from enabling voice service through to the configuration of complex data service settings.
Client provisioning is often a one-way push mechanism, where new configuration settings are pushed to the device, with no return path to query the existing configuration.

An advantage of client provisioning is that it can perform ‘Bootstrap’ configuration. This is where the very first data connection is added to the device, enabling all other data services. This is enabled through OTA provisioning messages being sent over a default bearer such as the SMS channel – an ‘always on’ connection that requires no prior device configuration.

Successful client provisioning services combine the provisioning mechanism with knowledge of the configuration parameters required for the desired wireless service. In this way the user simply has to choose their wireless service, and doesn’t need to remember all the complex server addresses and other configuration information needed to enable the service on the device.
Client provisioning systems provide an over-the-air update solution based around the OMA Client Provisioning specification, or a manufacturer-specific specification such as ‘Smart Messaging’. Many legacy devices on the network today support some form of client provisioning to update service settings. These provide the ability to configure one or more of the following:
- Data connection
- Browser settings (WAP or XHTML)
- MMS settings
- Email settings (POP3/IMAP4 client)
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- SyncML Data Sync settings
- Browser bookmarks/favorites

Client provisioning often makes use of the SMS bearer channel for the delivery of the Configuration setting.

Functions of DM
- Firmware over the air updates (FOTA)
- Diagnostics
- Remote Configuration and Provisioning
- Security
- Backup/Restore
- Network Usage and Support
- Server Deployment
- Inventory
- Device Provisioning
- Software Installation
- Troubleshooting and Diagnostic Tools
- Policy Application
- Logging and Reporting
- Remote Control and Administration

The role of Knowledge DM
The DM platform is not a standalone component, but forms part of the wider service delivery solution. It must interface to other platforms and integrate into processes and events within the network. This integration presents a challenge – the aggregation of knowledge around the devices, applications, services and content to ensure that when a device is managed it is done so in a stable and compatible way – an ‘Expert System’ within the solution. Below is the DM real life circle show how knowledge is transferred.
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Figure: 3.04 DM real life circle.

(i) **CRM**

Integrating DM tools for a wide flow of knowledge
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Figure: 3.05 integrating DM tools in the CRM

Here we can see that Dm in integrated by using the web base portal and update is also carried out directly with the knowledge of the end user which makes it easy and effective for the support Agents and the end users.

(ii) CONTENT MANGEMENT

In the above figure 3.06 shows the how the process and technologies which are the evolution life cycle of the device been managed .which are ex. Text, documents multimedia, audio, video, web base application.
In the above figure we should see how FOTA update is carried out. When a request is made from the client it is sent to the DM server and the DM server which is the central management controlled by an admin sends out command in binary code SMS messaging which could be used for updates or what every the client require, it is then transferred to the mobile client command center from the mobile command center update is send to millions of mobile users.
(iv) **ENGINEERING**

The engineering dept is where all the repairs, testing/verification and upgrades are carried out, and if any fixes is done performance monitoring is carried for a period of time with warranty.

![Figure: 3.08 The functionality of engineering in DM.](image)

The engineering dept is where all the repairs, testing/verification and upgrades are carried out, and if any fixes is done performance monitoring is carried for a period of time with warranty.
(V) USERS MANAGEMENT

Figure: 3.09 Users management security management

For this solution lots of research is going on right now as regards users management because it is one of the sector that has the greatest loop holes. Here the security of the device is managed from sabotage and other fraudulent activities.

Why do devices need managing?

Until recently most devices were provided in a ‘one size fits all’ model – where a Device Manufacturer provides a single product build to a Network Operator. A particular phone model always has the same packaging, operating system, pre-installed applications and services. This provides a very stable and scalable solution for core wireless services, but assumes all users will want to use the device in basically the same way.
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There are a number of drawbacks to this model, and these form the basis of the DM business case – where investment can be justified through the cost savings and increased revenue opportunities offered through DM. Some of these drawbacks are outlined here;

Addition of new services As the Network Operator rolls out new services there is little or no way to update devices in the field (and hence the existing user base) to benefit from them. This presents a two-fold problem – to benefit from a new service existing users would be required to upgrade to a new device. Not only does this slow the adoption of a service, but it also gives the user the choice to move to an alternative network provider at the point they upgrade, which may drive churn.

By updating legacy devices to benefit from a new service, it’s possible to offer new value to existing users and increase the appeal of the overall network offering, reducing the likelihood of changing provider, particularly if that decision is purely price driven.

Providing a marketing message that includes an introduction to using the service, as well as other relevant customer education material will increase visibility, as well as the customer’s confidence in trying the new service.

The addition of new applications and services on the device will also increase the user’s awareness, and will help to drive an earlier usage.

(i) Addition of new services

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(ii) Personalization

With increased penetration of the Internet, many more users want their mobile experience to look and feel as much like the one they get at work or home as possible. This could mean access to their existing email account, instant messenger application, or in the Enterprise space their line of- business applications.
New services often allow a more personalized experience based around the user’s context, rather than the type of user they are. Broad segmentation into categories such as ‘Consumer’ or ‘Enterprise’ is being replaced with far more granular differentiation. After all enterprise users are also consumers, and the applications and services they want to use are driven more by their current environment than by the type of user they are. This increases the complexity of configuration, with every user’s device being a unique mix of applications and services.

The following table highlights some of the elements of the device that may be of concern to particular stakeholders:

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Device Base</th>
<th>Type of customization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device Manufacturer</td>
<td>All devices manufactured</td>
<td>Local Operator settings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Language Regionalization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Core applications</td>
</tr>
<tr>
<td>Network Operator</td>
<td>All devices on the network. From all manufacturers.</td>
<td>Branding</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Network Service parameters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Partner Applications</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Market segmentation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Security</td>
</tr>
<tr>
<td>Enterprise Customer</td>
<td>All devices purchased by the Enterprise. Across all networks. From all manufacturers.</td>
<td>Enterprise access parameters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enterprise security</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Email</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Line-of-business applications</td>
</tr>
<tr>
<td>End User Customer</td>
<td>Device owned by the end user.</td>
<td>Personal Email and wireless services</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Applications</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Themes and other content</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Individual preferences</td>
</tr>
</tbody>
</table>

Figure: 3.10 Handset Preferences and Their Impact for Service Providers

It can be seen from this table that the various stakeholders have very different customization requirements, and that for a DM solution to be effective all parties must have an opportunity to customize the device.

Configuring these services on the device requires the user to have a certain level of knowledge, and is often hindered by the nature of the user interface on the device. A high percentage of customer support calls are around this initial configuration.

(iii) Problem fixes
The ever-reducing time to market for devices, coupled with increasingly complex and tightly integrated network services will continue to cultivate issues and bugs. Today the mechanisms to
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fix these issues are limited, and usually consist of a long customer support call or a physical return and re-flash of the device.

Today’s solutions are reactive. Typically the Network Operator will know that an issue exists for a particular product but it still requires the user to discover the problem, contact customer support and work through the fix using costly customer care minutes. If device updates could be provided automatically to the device it may be possible to fix an issue in the field before the user is ever aware of it. This will reduce the cost of support and improve customer satisfaction.

If pro-active upgrading of the base is cost prohibitive, then documenting the solution in web self service environments or through mobile help applications will also help to reduce the cost of support. In any scenario where the device is updated in the field care must be taken to ensure the update does not create new unforeseen issues, which may actually increase the customer support requirement.

How are devices managed today?
Since the introduction of cellular wireless data in the early 1990s devices have been managed by modifying settings through the user interface, or later through Over-The-Air (OTA) Provisioning. Below is the evolution of device management over the years.
Although forthcoming DM technologies provide a far more powerful management method, they are managing the same device features that have historically been configured through a manual process, with the end user making changes directly on the device – often aided by support agents within the network operator’s call centers. This ‘hands on’ approach to device configuration has required a large amount of knowledge to be retained by the network operator to effectively troubleshoot every type of potential problem. DM technologies should therefore be treated as part of a wider support solution. The traditional requirement for discovery, fault finding, troubleshooting and diagnosis are still as relevant with DM as they are in the current support environment, and there will still be occasions where DM cannot solve the problem and human intervention is required directly on the device.
How will devices be managed tomorrow and beyond?
DM technologies offer interactive management capabilities, allowing two-way communication with the device for remote configuration, and providing a new source of information to the network operator – configuration and diagnostic data directly from the wireless terminal. This information provides the opportunity to make device support proactive. Problems could be identified and fixed remotely, perhaps without the user ever being aware. This has significant potential for cost savings within customer care, as well as enabling new services to drive revenue.
A further benefit will be that more features of the device can be managed compared to today’s manual methods. This is because the network operator will maintain the ‘management authority’ for the device – granting permissions to modify parameters which up until now would have been locked down from the user.
With this increased flexibility and power comes the risk of significantly harming the device. Management changes that apply incorrect service parameters, incompatible software or the wrong Operating System patch could actually do more harm than good.

Who will have access to the DM system?
To maximize the benefit, access must be provided to a range of users within the network operator, manufacturer, and in many instances directly to the customer. We therefore cannot rely on the user of the having the knowledge, training or experience to fully understand how to manage the multitude of potential devices on the market.
A significant ongoing task will be to manage current and accurate knowledge about the device, the network, the applications and services, and to integrate this with the DM platform to ensure devices are managed effectively.

What kind of knowledge needs managing?
One goal of integrated knowledge is to ‘do no harm’ to the device. Ensuring all device management activities are stable, safe and effective. For this to occur, a range of knowledge must be managed for each device build on the network, including:
• Device features and capabilities
• Knowledge about what services or applications the device supports
• Third party device and accessory compatibility
• Known bugs, issues and behavior
• Available updates (firmware, device drivers etc.)
• Feature enhancements and fixes available from updates
• DM method for each configurable feature (OMA DM, client provisioning, manual setup Only)
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- Scope of compatibility with the Network Operator’s DM platform
- Frequently asked questions
- Documentation such as setup guides, user guides or call center scripts
- Details of the correct configuration settings and parameters
- Knowledge that the requested change is compatible

The Expert Knowledge within the DM solution
The challenge of ongoing knowledge management can be addressed through a framework that provides the expert device knowledge within the DM solution – a ‘Knowledge Service’. The goal of the knowledge service is to ensure that any device management event is executed in a way where:
- The user requires little or no knowledge about the technology
- The management change does no harm, is stable, compatible, tested and known to work
- Customer facing representatives within the network operator or manufacturer are empowered to manage devices in an expert way
- Changes can be made in a proactive way before the customer is aware of a problem
- A suitable level of information and training is provided to the customer
- Any user can undertake troubleshooting and fault finding processes through step-by-step wizards.

The complexity in delivering these goals includes and understanding of what services the device is compatible (or more importantly incompatible) with, what known issues are occurring with the device in the field and what updates or fixes are available for an identified problem.

4. Overview of (Customer Relationship Management) CRM

Customer Relationship Management has been given a number of definitions since its inception.

Cunningham (2002) defines CRM as a description of “how we interact and proactively manage our customer relationships.” Dyché (2002) describes it as “the infrastructure that enables the delineation of and increase in customer values, and the correct means by which to motivate valuable customers to remain loyal – indeed to buy again.” Bergeron (2002) has a much simpler definition, stating that “CRM is fundamentally about the ongoing relationship between people-the suppliers and customers of goods and services.”

So which is it? Does CRM mean that the business must mould itself to the image the customer expects to see? Or must one attempt to manage the customers view to see the organization in a better light?
In truth, it is a mix of the two. Like any relationship, it is a give and take methodology that keeps the customer-business relationship intact. As Freeland (2003 pg.3) says;

Most executives recognize that keeping customer relationship strong and profitable in the future will require the right mix of innovative information technology, more effective business processes, better data management, and new workforce initiatives.

Freeland (2003 pg.4) moves on to mention the growth of CRM and the rising standards for excellence;

The past decade was one of intense change and explosive innovation. New technologies emerged more frequently, disrupting the stability of entire markets. Customers became more mobile, informed and demanding, and competitors became more adept at quickly improving their operations.

To summarize, a business must keep up with its customer’s expectations if it is to retain or develop its market share. This does not apply to mobile technology organizations alone, but every customer facing business throughout the world. The main goal of most private sector organizations is the make a profit, and to do this, they will be required to meet the demands of the customer. Doole et al. (2005 pg. 164) summaries the whole scenario well:

From a cost point of view, organizations would like to produce the same product or service day in, day out, as once they have paid for the original setup or tooling of their operations, they can run their operations to maximum efficiency without the expensive disruption of stopping and changing to accommodate different products all the time.

So if the aim is to prolong the product lifecycle to help reduce costs, it is logical to assume an organization would seize the chance to efficiently fix bugs or problems that would contribute to the reduction of the product lifespan.

**Critical Success Factors for CRM and Device Management**

It seems that successful application of CRM rests on the ability of the organization to prove to the customer that they are reliable, attentive, and responsive to the errors that are reported.

Bungie, a gaming developer, is well known for its responsiveness to issues and bugs related to its games. Halo, the flagship game for the company, is monitored via internet connection during play for bugs, cheating, glitches, and potential improvements to the system. The Bungie website also allows users to provide feedback about what they would like to see in the games in the future. Every few months, Bungie collates this information and releases an automatic firmware update to the game.
Most of the time, the users are not even aware there is an issue. The application of this style of DM however, coupled with the high level of interest Bungie takes in its fan base, means that its customers remain loyal, and the reputation of the organization as a high class games developer is maintained.

It is important that the present CRM methods are kept in place as a backup to the DM standards. No system is 100% foolproof, and there will always still be instances where a customer will need to speak to a person to resolve an issue.

WDSGlobal operates such a support centre. Over two hundred employees work throughout the day taking support calls for various manufacturers and network operators. Various OTA systems for WAP and MMS settings are used to fix certain problems, but there are still cases where lengthy conversations are required to solve certain issues.

**Defining a support infrastructure**

The deployment of a management solution may change the way customer care is structured, as use cases that were previously handled by tier 2 or tier 3 technical resources may now be solved through effective placement of DM tools, knowledge and training at an earlier tier. Web based self service will also play a larger part in answering support issues without requiring a call into customer care.

When defining a support structure it should be noted that device management is not the answer to all support issues. The traditional process of fault finding and problem diagnosis is still required, but can be benefited by the effective placement of knowledge and device management tools.

In a traditional support model complex device issues escalate through to progressively more skilled (and expensive) resources. Due to the skill sets required the knowledge to resolve problems usually stays within tier 2 or 3, and seldom filters back to tier 1. With a device management solution in place, the knowledge that previously only existed within the advanced support groups can be delivered out to the wider support organization through knowledge-driven device management activities.

The result is that calls can be handled within the mass support organization in a more efficient way, reducing the total headcount required for device related support within tier 1 and 2, and improving the customer experience by solving the problem in a shorter time without the call being transferred.
The implementation and role of device management solutions
To the End users.

Figure: 4.01 Traditional support model advanced device knowledge seldom passes into the wider Support organization.

Figure: 4.02 Integrating DM tools for a wide flow of knowledge

Integrating DM tools enables a wide flow of knowledge, reducing the headcount and improving the customer experience. By integrating knowledge into the process of managing the device the requirement for staff training can be reduced. This is particularly important in tier 1 call center environments where staff turnover is typically very high. Wizard driven processes and guidance will empower the tier 1 agent to handle more advanced data related calls with confidence, without immediately escalating to a higher tier with more costly support minutes.
The implementation and role of device management solutions
To the End users.

The tier 3 advanced support group can now be more efficiently utilized to generate knowledge and fixes for the entire support organization. This provides a more scalable method of support as the size of this team does not have to track with increases in call volume.

There will be occasions where certain issues occur that cannot be solved by the normal use of the DM solution. Perhaps with a newly occurring problem, a new device launch or a complex issue with a wireless application and service combination.
In this instance the advanced support group should have wider access to device management tools, perhaps with a front end that allows a greater management capability than that normally made available to the main support organization of the customer. This resource could be considered the ‘intelligent hands’ to the device management platform, an expert team able to deal with the leading-edge problems associated with new wireless technology.

5. Data Analysis

Introduction
The first step taken for the primary research was to send a survey (Appendix C) to the technical support agents based at WDSGlobal. These agents support many technical contracts from across Europe, and deal with many problematic issues faced by customers.

Due to restrictions within the call centre, it was difficult to get responses back from all of the agents. Out of the surveys sent out, few were returned. It is hoped to confirm the findings using the survey sent out to mobile phone users (Appendix D).

The second survey was designed with mobile phone users in mind, and with the aim to find out what issues they have experienced with customer support centers, and what could have been done better. The second survey faced some restrictions by the provider in that it would only allow a maximum of fifty two responses. This has once more limited the validity of the surveys. It is still hoped, however, that a strong trend will be found in the results.

As mentioned in the Research Methods, The results of these interviews (CRM & DM term leader) will be compared and contrasted with the survey results.

In total, there are 67 responses via survey, and three in depth interviews to explore these findings.

It is hoped that the responses will prove that there is indeed a demand for a DM style approach to customer support and that technical support centre’s are willing to incorporate the process into their current systems.
Survey to Technical Support Agents
It was decided early on in the research that if an understanding of the customer’s experience with customer support centre’s is to be gained, then we must also understand the role of the agents.

The quality of the customer experience on the phone comes down to the level of care and attention they receive from the agent. The aim of this survey was to prove that agents do indeed put the customer’s needs first, and try everything possible to help.

The surveys were anonymous, and there is no record as to which agent has filled in which survey. The purpose of this is to gain an overview of the support desk as a whole, and not concentrate on individual results.

The first eight questions of the survey determine what the agents think of themselves, how high they consider their services to be, and how many calls they think they receive. It also asks how the agents rate their environment, and how often they use the current DM tools at their disposal.

In figure 5.01 (above) we can see the amount of calls agents take in one average day. The X axis represents the calls taken, while the Y axis displays the amount of agents that selected the option. For example, two agents believe they take over 51 calls on average every day. This alone does not tell very much in terms of how DM is being implemented until we compare it with figure 5.02.
The implementation and role of device management solutions
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It seems DM techniques are under-utilized. In figure 5.01 we are told that most agents believe they take between 31-50 calls in a day, however, the OTA tool is used for 1-10 of those calls.

We can then compare this finding with the average call time in Figure: 5.03 (below).

Figure: 5.03 - Average Call Time
In this hypothetical situation, if the average call time is 7-9 minutes, and there are 31-50 calls taken in a day, an agent is on the phone for an average 333.5 minutes every day. If DM techniques such as device remote access and self-updates were implemented, these call times could be reduced.

Agents were also asked what they thought the most important elements of a call were from the following options:

- Call Handling Time
- Customer Satisfaction
- Solving the Problem
- Empathy
- Listening Skills
- Logging the Call Correctly
- Having Specific Product Knowledge
- Remaining Calm and Non-Aggressive

Three agents answered this question incorrectly and as such inconsistencies developed in the data. To improve the validity of this section, those answers have been omitted.

All results were collated into a table, and the scores displayed into them. The average ranking was then worked out using the following formula:

\[(\text{Ranked Position} \times \text{Amount of agents selected}) \div \text{The total number of responses}\]

For example, the Customer Satisfaction option was worked out as per Figure:5.04 (overleaf). All other rankings can be found in Appendix E.

<table>
<thead>
<tr>
<th>Customer Satisfaction</th>
<th>No. of Agents</th>
<th>Agent*Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranked 1</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Ranked 2</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Ranked 3</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>
The implementation and role of device management solutions
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<table>
<thead>
<tr>
<th>Position</th>
<th>Option</th>
<th>Average Rank TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Customer Satisfaction</td>
<td>2.3125</td>
</tr>
<tr>
<td>2</td>
<td>Solving the Problem</td>
<td>2.5625</td>
</tr>
<tr>
<td>3</td>
<td>Listening Skills</td>
<td>3.625</td>
</tr>
<tr>
<td>4</td>
<td>Remaining calm and non-aggressive</td>
<td>4.0625</td>
</tr>
<tr>
<td>5</td>
<td>Having specific product knowledge</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Logging the Call Correctly</td>
<td>5.5</td>
</tr>
<tr>
<td>7</td>
<td>Empathy</td>
<td>6.125</td>
</tr>
<tr>
<td>8</td>
<td>Call Handling Time</td>
<td>6.8125</td>
</tr>
</tbody>
</table>

Figure: 5.04 - Working Out Customer Satisfaction Ranking

After carrying out this process on all eight options, the average rankings are listed as follows in Figure: 5.05.

As it stands from these results alone, the primary goal for the technical support agent is to ensure the customer is happy with the service they receive, and that the problem is solved.

To summaries, it appears that the support agents within WDSGlobal are not using the DM procedures to their full potential. This could be down to a large number of factors such as incompatible devices, problems that are too technical for automatic repairs, or restrictions of the company itself. This will be explored in more detail further on when compared with other research.

It appears that the aim of the agents is not only to solve the customer’s issue, but also to ensure that the customer remains happy with the service they have received. If this requires that the call run on for a long amount of time, it does not become a factor in the troubleshooting procedure. The agent will continue to analyze and troubleshoot until the customer's issue is resolved.
The traditional method of managing device in CRM.

Figure: 5.06 Analysis of the traditional method used for DM in the CRM

Here we can see the 334 which is the number of time used for attending to the 40 clients who called in the call center. From this graph we can understand why the method must be changed because it is not cost effective. Below we shall take a look at it when DM is been integrated.

Analysis of DM solution integrated in CRM

Figure: 5.07 Integrating Dm in CRM
With the integration of Dm solution in CRM we could see a great change in the process calls system where we have 30mins for 12 calls which is a very good system and this will help the company save money and work will be done effectively.

**Comparison Analysis**

![DM comparison analysis](image)

*Here we compare the traditional method and the present DM management tool.*

Figure: 5.08 The comparison between the traditional method and the preset DM method.

From the above figure it became clear that Dm solution was very vital to the industry and has a very important role in saving cost, and given the customer a great experience.

**Survey to Mobile Device Users**

Over 200 surveys were sent out to the technical support department at WDSGlobal. Due to restrictions of time and workspace however, only a limited number of replies were returned, impacting the validity of the data received. To back up the conclusions made, a second survey was produced for the mobile device users themselves. This online survey was presented to users...
of mobile devices to establish what their views of customer support and DM are. It was decided to concentrate on the younger generation of mobile users as many studies have proven that these users hold the greatest market share.

In total, fifty two people responded to the survey. Forty three of these respondents were in the 17-25 age range (Figure: 5.09 below). Two of the respondents felt that they were not competent users of information technology.

<table>
<thead>
<tr>
<th>1. What age range do you fit into?</th>
<th>Response Percent</th>
<th>Response Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Under 16</td>
<td>1.9%</td>
<td>1</td>
</tr>
<tr>
<td>2 17 - 20</td>
<td>28.8%</td>
<td>15</td>
</tr>
<tr>
<td>3 21 - 25</td>
<td>57.7%</td>
<td>30</td>
</tr>
<tr>
<td>4 26 - 29</td>
<td>1.9%</td>
<td>1</td>
</tr>
<tr>
<td>5 30 +</td>
<td>9.6%</td>
<td>5</td>
</tr>
</tbody>
</table>

Statistics based on 52 respondent(s). 0 skipped.

Figure: 5.09 – Age Ranges of Respondents

Questions five (Figure: 5.09 overleaf) and six (Figure:5.10 overleaf) from the survey quiz the respondent on their ability to use the phone to its full advantage, asking how well they understand the functions their handset offers, and contrasting this with how many of these respondents have read the user manual for their device.

<table>
<thead>
<tr>
<th>5. On a scale from 1 (poor) to 10 (excellent), how familiar are you with all of the functions your phone is capable of?</th>
<th>Response Percent</th>
<th>Response Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>1.9%</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>3.8%</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>3.8%</td>
<td>2</td>
</tr>
</tbody>
</table>
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To the End users.

Statistics based on 52 respondent(s). 0 skipped.

Twenty five percent of all respondents from Figure: 5.09 claim to understand every function that the device offers. In comparison with Figure: 5.10, 78.8% have not read their user manual. It is difficult therefore, to understand how a user can understand every function available without checking what the manufacturer offers.

6. Have you read the manual for your current phone?

<table>
<thead>
<tr>
<th>Response</th>
<th>Percent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>21.2%</td>
<td>11</td>
</tr>
<tr>
<td>No</td>
<td>78.8%</td>
<td>41</td>
</tr>
</tbody>
</table>

Statistics based on 52 respondent(s). 0 skipped.

Figure: 5.11 – Reading the User Manual

It is possible, however, for a customer to be familiar with a device before purchasing it, especially if they have had similar handsets in the past that they have owned for some time and used on a regular basis. Question 7 (Figure: 5.11 overleaf) shows us that 78.8% of respondents have owned more than five mobile telephones in their lifetime. Mobile device operating systems such as Windows Mobile or Symbian do not change much with each software update, and the overall interface remains the same. It is not unreasonable to assume a customer may understand their new device based on their past experiences, without reading the user manual.

7. How many mobile phones have you owned in your lifetime?

<table>
<thead>
<tr>
<th>Lifetime</th>
<th>Percent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.9%</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1.9%</td>
<td>1</td>
</tr>
</tbody>
</table>
The implementation and role of device management solutions
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The respondents were next asked about specific problems they may have had with their mobile phone, and if they had ever sent their handset away to be repaired. It is a well known issue within call centre’s that sometimes an agent will assume, based on their past experiences, that a handset will be faulty without performing a full diagnostic test. The results of the question are shown below in Figure: 5.13 below.

<table>
<thead>
<tr>
<th>Response</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>30.8%</td>
</tr>
<tr>
<td>No</td>
<td>69.2%</td>
</tr>
</tbody>
</table>

Statistics based on 52 respondent(s). 0 skipped.

Figure: 5.13 – Phones sent for repair

It was interesting to compare these results to question 10 (Figure: 5.14 below).

<table>
<thead>
<tr>
<th>Response</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>24.2%</td>
</tr>
<tr>
<td>Software</td>
<td>18.2%</td>
</tr>
<tr>
<td>Both</td>
<td>12.1%</td>
</tr>
<tr>
<td>Neither</td>
<td>18.2%</td>
</tr>
<tr>
<td>Don't Know</td>
<td>27.3%</td>
</tr>
</tbody>
</table>

Statistics based on 33 respondent(s). 19 skipped.

Figure: 5.14 – Cause of Fault
Figure: 5.14 displays the results of a question asked to ascertain what conclusion the support agent reached at the end of the call. When compared with Figure: 5.13, the results do not seem to add up.

In Figure: 5.12, sixteen handsets were sent away for repair. In Figure: 5.14, eight handsets were found to have a definite hardware problem, and four with both a hardware and software issue. This makes a total of twelve devices that required a repair. It is interesting therefore, to wonder just what happened with those extra four devices that do not seem to be listed.

Software issues rarely require the device be sent to a service centre. Resetting a device, or reinstalling a ROM image usually resolves all software issues a device can generate unless the problem is hard coded into the software. In this case, DM could be utilized to provide Firmware-Over-the-Air (FOTA) upgrades. In other cases, remote access into a device could enable an agent to check the device settings for their troubleshooting, and ensure the device is configured for optimum usage.

Handsets being sent for repair when they have no physical fault, this causes a great inconvenience to all parties involved. Firstly, the customer must be without a device for an extended period of time. Secondly, the support centre must organize and book in the repair. As a next step, a courier must be booked to transport the device, costing the manufacturer. Lastly, the service centre must spend time running a full diagnostic of the device systems, only to find the issue was an option that was incorrectly activated. What could have been resolved in a short call has taken a much longer length of time, expenditure to the handset manufacturer or network operator, and crucially, irritated the customer. It is in areas such as this that DM techniques are needed.

Appendix F, Mobile Device User Survey Support Centre Experiences lists some of the calls and experiences that the respondents say they have experienced when calling support centres. These comments demonstrate how some customer support calls have not met the high standards customers expect of international companies.

All of the answers are real comments from the respondents of the surveys. They highlight a glaring problem with DM, and one that must be rectified if it is to be implemented successfully.

The respondents all made similar claims in different ways. “Lack of communication”, “would not listen”, and “failed to understand” are reoccurring themes throughout all of the answers displayed in Appendix F. The problem with DM is that the support staffs begin to rely too heavily on their systems, and lose focus on what the agents themselves in Figure: 5.05 (page 50) list as the third most important factor in a support call – Listening Skills.
The overall aim of this survey was to back up the view of the customer support agents. From the results of the second survey, we can see that the users are indeed becoming technically active, and require a higher level of support than perhaps was required ten years ago. Agents must be technically competent to deal with these issues, and provide a confident front for the represented company to the customer.

The main grievance that the respondents were complaining about related to the apparent lack of understanding and support from the customer services team. For this reason, it was decided to seek further validity from experienced sources of knowledge.

Call flow OTA DM

Having talked about agents having specific product knowledge, we intended to show a diagrammatic explanation of the call flow system implemented using DM technique.

The flow diagram in Figure: 5.15 (page 58) shows how this theory is made possible, this explains the call handling on the support center as a DM solution implemented to the end user. Each aspect of the call relates to a certain part of the conversation, with the importance of each factor changing depending on which stage of the call the agent is at. As shown below, the call should start by listening to the problem, and staying calm if the customer is angry. The end result should be to solve the problem and satisfy the customer.
Although not part of the original question within the survey, the call flow diagram above does allow us to identify the elements for which DM may be used.

This chat programmed in DM system as a standard for grading staffs SLA, this means that before DM is deployed to the end user the agent should have a solid product knowledge and good understanding of the specific product with out having to waste customer air-time.

The technical support survey seems to indicate that the current DM OTA tools are not utilized to their full advantage. It is believed however, this is simply down to the incorrect types of calls being taken. The emulation or remote access ideas are ones that have so far been seen positively, and having the option available to an agent to use would certainly allow the potential for better support to the customer than having no extra aid at all.

Interviews were conducted with members of management and senior technical support team at WDSGlobal to see if any light could be shed on the customer complaints.
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Comments from the DM/CRM manager, to establish validity of the survey.
His role is to manage the service delivery and expectations of High Tech Computing (HTC) Europe, a client of WDSGlobal within the support centre, ensuring that the client’s business requirements are met, and that the support centre staffs are fulfilling their roles.

HTC Europe is an international developer and manufacturer of high end smartphones and PDA devices. Their devices are used by all from high level executives of international companies and low end public users. WDSGlobal serves this large company by offering technical support for its customers via its support centre.

As a result of this reputation and his role as a customer relationship manager, with great knowledge on DM management it was decided he would be a perfect candidate for interview as he understands not only the support agent role, but that of a manager dealing with service delivery, device management and customer expectations too.

At the time of interview, the surveys had been completed and the results gathered. The objective was to establish the validity of these surveys with an expert in the field of device support and management.

When asked to define DM in his own words, he identifies it as a method of managing a customer’s handset by way of OTA updates, remote access, and resolving problems before they are identified by the customer.

He also points out a drawback that DM may have on the agent’s technical ability. Speaking of first line support centers, he talks about how the initiatives once displayed by support centers seem to have been lost and instead replaced by standardized scripts.

He also came up with an initiative that WDSGlobal is considering. Remote access for PDA devices is something that has been considered for some time. The theory is that an agent speaks to a customer who is not very confident with the specific settings of their device. The agent would remote access the device and configure the device to the customers preference. This would reduce call time used by trying to explain to the customer where they need to go in the device.

Although the call time would be reduced, it also means that the customers would not have the knowledge of the device they would have gained had the procedure been explained to them. This raises the potential for further calls in the future.

When asked how he thought the process of remote access could be implemented, he compared the procedure to that of Logmein mobile. Logmein is a company set up in 2003 that allows
remote access to a PC via a web browser. A mobile phone application has recently been designed that allows the customer to use their handset to access their PC.

He mentions the method of sending a similar application to the customer to install, or integrating the application into the handset operating system upon manufacture. The agent would generate a PIN number that the customer would need to type into the handset to allow the agent access. This would ensure the connection was secure, and that a person could not hijack a device without the appropriate random PIN number being generated.

He had attempted to raise the possibility of using this technology in the past. He faced opposition however, as the handsets on the market were not of a standard that would make the project feasible.

The dilemmas of such technology do not end here. Within the user survey, customers were asked whether they would be willing to allow an agent access to their handset to help solve an issue (Figure: 5.16 below). Although the majority claimed they would not have an issue with such technology, 38.5% claimed that they would not be willing to allow such a procedure. When asked about this, and how this potential issue could be overcome, he agreed with the customers view. His claim that people “will just not want you to have access to their phone” was backed up by his description of the types of companies that WDSGlobal supports. A lot of the customers that call the support centre are high level business executives, and as a result have a lot of confidential information on their handsets. Remote access would not be an option for customers such as this.

<table>
<thead>
<tr>
<th>14. Would you be willing to allow a customer service operator to remotely access your handset to help solve a problem?</th>
<th>Response Percent</th>
<th>Response Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Yes</td>
<td>61.5%</td>
<td>32</td>
</tr>
<tr>
<td>2. No</td>
<td>38.5%</td>
<td>20</td>
</tr>
</tbody>
</table>

Statistics based on 52 respondent(s). 0 skipped.

Figure: 5.16 – Remote Access of Handset Views

It would be possible to reassure the customer by ensuring that they still have primary control over the device. With the system he describes that the customer would be able to see what the agent accesses by way of a mouse cursor on the screen. The customer would be able to view each menu and function accessed as the agent works. If there are any specific areas of the device that the customer does not want the agent to access, they can end the connection. If a customer would not allow remote access, the standard methods of a troubleshooting call could be implemented to allow the agent to resolve a problem.
This relates to another question he was asked about whether depending on such technologies could detrimentally affect an agent’s technical knowledge. He did not think this to be the case. To quote,

….“If they (the agents) didn’t train to a level where they could do troubleshooting over the phone and know where they are going, then it wouldn’t make a difference whether they are doing it themselves or whether they are telling the customer to do it.” In essence, in order to utilise tools such as remote access, the agent still needs to have the same level of technical knowledge as if they were troubleshooting by instruction over the phone.

Discussion then turned to what other tools could potentially be implemented within the support centre that would help the agents reach their top aim of customer satisfaction, and provide a better service to the customer. In his own words, he would like to see:

...the ability to firmware over the air – FOTA. Even if its not firmware updates, the ability to have some way of managing updates and sending them out to customers dynamically so like Windows Update we have on HTC phones, what they can do is they can just upload any updates available for the phone to a managed server and the customer... every so often goes in, sets it to check once a month when it connects to Wi-Fi and then downloads it and installs any updates available, similar to how Windows does on a computer.

At the moment, if a customer wishes to update their device, it requires them to own a computer with internet access They must then access the manufacturers website, register themselves as a user, register their device, download the update, ensure that software is installed to manage the handset connection to the PC, and finally install.

According to the survey of mobile device users, 71.2% of the respondents have never tried to update their device (Figure: 5.17 below), presumably as they do not see the advantage in doing so. When talking about this lack of firmware updates, he supports this view, claiming that ….the main public user base still wants a phone that simply carries out the most basic of functions: - voice calling and text messages.

<table>
<thead>
<tr>
<th>15. Have you ever updated the firmware of your phone?</th>
<th>Response Percent</th>
<th>Response Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Yes</td>
<td>28.8%</td>
<td>15</td>
</tr>
<tr>
<td>2. No</td>
<td>71.2%</td>
<td>37</td>
</tr>
</tbody>
</table>

Statistics based on 52 respondent(s). 0 skipped.
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Figure: 5.17 – Firmware Updates

Such updates, however, are difficult for a company to justify. When a product is released to the general population, it is expected to be of a high standard, and as such, updates to fix “issues” with the device can become a matter for concern. Legal issues are also a matter of concern, if a customer has been faced with the issue for an extended period of time.

One of the ways companies such as Nokia and SonyEricsson navigate around this issue is to claim the upgrade improves functionality, rather than fixes known issues. For example, if the devices are having an issue connecting to Bluetooth car kits, the manufacturer would claim they are expanding their list of supported devices, rather then claim they are fixing the issue.

In regards to the ranking system in Figure:5.05, he mentioned that having specific product knowledge is immediately picked up on as an element that should be more important. Raising the issue of call scripts, and linking to customer satisfaction, it is claimed that having knowledge of the product provides a far greater experience for the customer than reading from a checklist.

In summary of this evaluation, it seems that the CRM is a great supporter of DM techniques. His views and ideas for supporting a customer largely support the research and information gained from the surveys, and adds credibility to those results.

Analysis through Use Cases

A method to measure the effectiveness of DM platforms is through the application of ‘Use Cases’. A use case could describe any process in the lifecycle of a device. Some are existing processes - such as a customer support call or the acquisition of a new customer, others may be new processes enabled by DM itself - such as the distribution of a software patch to fix a device issue, a customer configuring their device in a self-service web environment or a network operator conducting a ‘master reset’ of the device over-the-air. Some example use cases are shown in Appendix B.

Measuring business benefit through Use Cases

Use cases form a valuable part of the business case for the DM platform as they will provide ‘real world’ metrics around the impact of a DM solution, and will prioritize the integration effort to target the business processes that will see the most benefit from device management.

The measurement activity could include:

• Cost of customer support today for the use case
• Cost reduction available through DM
• Any projected increase in ARPU through enablement of new services
• Measurement of customer experience/quality of service metrics
• Effects on churn
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• Costs of deployment of the DM platform
• Cost to maintain knowledge through the lifecycle of the device

Identifying suitable technologies

Analysis of use cases helps to identify the types of servers that will be required. To ensure the solution benefits the maximum number of devices on the network information should be gathered on the range of devices a given platform supports. The result of this research may be that multiple technologies are required to perform the same use case across all devices on the network. An example of this could be the configuration of email. Legacy devices often use OTA client provisioning for configuration of email settings, where future devices may require this configuration to take place through OMA DM. Both solutions must use the same knowledge – in this case information about the email server settings for the network’s email service or a third party ISP, but will use a different method to configure the device. In some cases the device may have no method for remote configuration of email settings. In this scenario it would be desirable to serve a personalized setup guide, complete with the server settings for the customer to enter directly onto the device - perhaps with the help of the customer care agent.

Comparison of Primary and Secondary Research

It is clear from all of the research gathered so far, and by simply walking into a mobile phone retailer, that mobile devices have become far more advanced than they were ten years ago. This was beginning to be noticed as early as 1997 when Cairncross (1997) wrote her text about the revolution of communication would change our lives. In order to keep up with the revolution, not only are the handset manufacturers and operators required to improve mobile technology, but ensure they make it as easy for the customer to understand as possible. The survey to the mobile device users helps to prove that devices are more complicated. Appendix F gives a brief insight into some of the issues customers are facing, and the lack of preparation some support centres have in trying to solve these issues.

WDSGlobal has proven it is an organization committed to providing this support. All of the interviews held showed the high level of commitment the agents and the managers have to resolving the customers issues, and the ideas they put forth prove that they do indeed proactively attempt to foresee a customers needs. The primary research however, suffered a flaw because of this enthusiasm. It may have been prudent to concentrate on another support centre that perhaps was not so prepared to deal with the types of issues customers’ face, in order to get a broader view of the situation.

As Freeland (2003, pg.4) states, “the past decade was one of intense change and explosive innovation”. The research has proven that if manufacturers are to continue making reliable
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products, and ensuring they remain operational, they must attempt to follow the examples set by support centres such as WDSGlobal.

So why would DM be important from the customer’s point of view? It was mentioned in the Literature Review that Cairncross (1997) believed it was becoming difficult for employees to separate themselves from their workplace. The applications that have revolutionized the way people communicate have meant it is impossible to truly “escape” from the office. Due to this, a lot of executive mobile device users cannot afford to be separated from their handsets for a prolonged period of time. As the survey of mobile device users has shown, some handsets can be sent for repair simply because the agent troubleshooting the device did not do so correctly, and a problem that could have been fixed over the phone instead meant the device being separated from the customer for a prolonged period of time. Therefore, if OTA and FOTA tools can be used to help resolve such issues, the customer would directly benefit. Physical damage to handsets does still occur however, and so the facility for a service centre must remain. In these cases, it would be unavoidable to send the handset for repair.

Bergeron (2002) defined customer relationship management as “the ongoing relationship between people – the suppliers and customers of goods and services.” As the survey to technical support agents proved, the agents themselves aim to provide customer satisfaction with every call. CRM role within the support centre is to proactively manage the resources available to them to ensure customers are dealt with efficiently, and within a single call. WDSGlobal has proven that DM can help these customers. This helps improve the relationship between WDSGlobal’s client company, and the customer.

From the survey it is believed that specific product knowledge was also a very important aspect of a call. This clear however, that by the results of the technical support agents survey, and validated comment from the CRM, it is believed that this is correct. As Doole et al (2005 pg.164) states, “organizations would like to produce the same product or service day in, day out.” Mobile device manufacturers have proven that they believe in this theory by releasing new devices with the same operating system installed. Examples include HTC Europe and Palm using Windows Mobile, Research in Motion using Blackberry Connect, and Nokia and SonyEricsson using Symbian.

All of these operating systems are identical, and as such the menu structure and methods of accessing a device remain the same. The only element that would change are any marketing bonuses that the manufacturer decides to include such as GPS functionality, or software elements network operators decide to add such as media applications. These specific details would not be required for every customer call, and if a customer did want to know about a specific feature, it can be found out whilst on the call.
Of course, having a set range of operating systems also makes DM implementation easier. An OTA update for a Nokia E65 is perfectly compatible with a Nokia E61 for example. On the outside they are two completely different handsets, one for business, and the other for media. The internal menu structure however, remains identical.

There is one flaw however that none of the agents seemed to realize. For DM to be successful, the parent organization must be highly critical of their own products, identify the issues with a device, and prove to the customer that they are reliable, attentive and responsive to the errors reported. There is no benefit investing in a DM infrastructure if the company is blind to its own faults, and does not provide updates to the customer. The CRM manager mentioned that some of the organizations are afraid to do this for legal reasons, but as the Literature Review proves, this is not always the case. Bungie are well known and respected as a company very loyal to their fan base. Some of the company executives browse online forums proactively looking for bugs and issues with their products in order to release updates to resolve them.

Instead of being criticized for releasing a product with bugs, they are praised as being an honest company willing to admit mistakes and resolve them as quickly as possible. Of course, a company cannot rely on this type of reputation for long, as a company that consistently releases faulty products is certainly not going to maintain a reputation as a reliable company.

Bungie shows DM can be done in a way that pleases the customer, and disproves the CRM manager’s theories about lawsuits and legal challenges. In most cases the users are not aware of any issue, and DM allows the manufacturers to proactively manage faults and issues before they manifest on a customers device. Ensuring that as few negative points as possible are discovered by a customer means that the reputation and respect of the organization is not placed at risk.
6. Future research /Conclusion and Reflections

Recommendation for the future research for DM

As an ever-increasing number of intelligent, networked devices connect to corporate LANs and the Internet, new issues and concerns emerge for dealing with device security.

Leaving these devices exposed to potential accidental changes, to sabotage, or to eavesdropping will become too great a risk for most businesses.

So my suggestion for future work is implementing effective security element such as secret key cryptography.

Figure 6.01 mobile security

Summary

Consumers today are faced with the growing problem of the confusion high tech gadgets and future technologies. Terms such as WAP, MMS, GPRS, 3G, VoIP, HSDPA and HSUPA are not easy to understand for the average customer, and the uses of these technologies are even harder. To be able to provide this knowledge to the customer, the manufacturers and network operators must have the relevantly trained support agents on hand to help the customer stumble through these confusing terms and tools.
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The technology itself allows the implementation of DM to become a natural choice of aid. DM can be used to access a device, update it, or allow an agent to diagnose an issue without the customer having to try to figure out all of the confusion surrounding the theory of the device.

The manufacturers and operators must also accept the responsibility this brings. They must ensure the agents they employ are trustworthy and have no malicious intentions to take advantage of possible information they may have access to on a customer device.

To this end, so long as the parent organization is proactive in its pursuit of improvement, and critical of its products, DM has the potential to strengthen the bond between the customer and the company.

The overall aim of the research was to determine the roles and implementation of device management solution to help the consumers.

To achieve the aim of the research, studies have been conducted into past mobile technologies and their impact on society by reading through literature and documents of experts in the field of both the past and present, such as Cunningham, Freeland and Rheingold. Research has also been conducted into the technologies available today, and how DM/customer support has had to change to accommodate these technologies. This was achieved via the sets of surveys sent, and the interviews conducted.

DM has been implemented to a high standard within WDSGlobal. The agents of this company seem to be well aware of how to use these technologies and have various good ideas about possible further future implementations. This became very evident whilst conducting the survey of the support agents.

DM technologies provide a flexible and powerful management method but are managing the same device features that have historically been configured manually through call centers or by the end user making changes directly on the device. For this reason DM technologies must be treated as part of a wider support solution. The traditional requirement for discovery, fault finding, troubleshooting and diagnosis are still as relevant with DM as they are in the current human support environment.

In the deployment of an effective Device Management solution the network operator must consider the integration of the DM platform, interfacing with many areas of the business, supported by knowledge of the relationship between devices, applications, solutions and services maintained on an ongoing basis.
Device Management will allow an effective flow of knowledge from advanced support groups into the wider support environment, showing cost savings as well as improving customer satisfaction through shorter support calls and less call transfers. Complementing the DM solution with published device information, setup guides, training material and web based tools will ensure the quality of the customer experience, ensuring the problems are completely resolved, driving data usage by focusing customer education on the use of the wireless service.

In this way device management becomes a tool used both internally within the network or device vendor and by the customer themselves, with each user empowered to effectively manage their device without any prior knowledge or experience, confident that changes they apply will be relevant, accurate, stable and compatible.

The analysis of these sets of data analyzed from this research it has proven to be most useful in determining where there could be room for improvement and possible expansion of DM, and also areas where perhaps it has become too invasive and the company must take a step back from the customer.

7. Conclusion

In this research i have been able to learn and have deep understanding of the importants of DM solutions and implementation in our fast growing Tech world. Having analized the users needs and analized the outputs when DM solution is implemented compared to the traditional method, it clearly shows that DM solution plays a very vital role in promoting research and development in the mobile industry, as such should be treated as a part of a wider support solution.
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8. References

**Hard Texts**


**Electronic Resources**

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9. Bibliography

Hard Texts


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Hansmann, U., 2003 Pervasive computing: the mobile word, 2nd ed. Springer

Hutchinson, D., AND Vicente, J., 2004, Management of Multimedia Networks and Services, Springer


Electronic Resources


### 10. Appendix A – Glossary of Acronyms.

<table>
<thead>
<tr>
<th>Term</th>
<th>Pages Used</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>3G</td>
<td>9,15,56</td>
<td>3rd Generation Wireless. A term used to describe the speed of mobile data.</td>
</tr>
<tr>
<td>GSM</td>
<td>9</td>
<td>Global System for Mobile Communications. The protocol over which voice calls are made and text messages are sent.</td>
</tr>
<tr>
<td>GPRS</td>
<td>9,30,56</td>
<td>General Packet Radio Service. A term used to describe the speed of mobile data.</td>
</tr>
<tr>
<td>HSDPA</td>
<td>9,15,56</td>
<td>High Speed Downlink Packet Access. A term used to describe the speed of mobile data.</td>
</tr>
<tr>
<td>HSUPA</td>
<td>9,56</td>
<td>High Speed Uplink Packet Access. A term used to</td>
</tr>
<tr>
<td>Term</td>
<td>Page Numbers</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>IP</td>
<td>15,26,30</td>
<td>Internet Protocol. The addressing scheme of packets of data.</td>
</tr>
<tr>
<td>MMS</td>
<td>9,33,35,56,59,61,64,69</td>
<td>Multimedia Message Service. A form of mobile messaging that allows the sending and receiving of pictures, videos and other media.</td>
</tr>
<tr>
<td>OTA</td>
<td>3,4,5,9,17,19,21,25,26,27,28,30,31,35,40,47,48,52,53</td>
<td>Over-the-Air. A method of sending updates via a wireless domain.</td>
</tr>
<tr>
<td>PDA</td>
<td>62</td>
<td>Personal Digital Assistant. A mobile device that combines office functions with the elements of a mobile phone.</td>
</tr>
<tr>
<td>SLA</td>
<td>48</td>
<td>Service Level Agreement. A set contract between two organizations when one is providing a service to the other.</td>
</tr>
<tr>
<td>SYNCML</td>
<td>25,33</td>
<td>Synchronisation Markup Language. A new standard set up by a</td>
</tr>
</tbody>
</table>
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collaboration of IT and blue chip companies to enable the synchronisation of mobile devices to be set under one standard.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>VOIP</td>
<td>15,56</td>
<td>Voice Over Internet Protocol. A protocol used to allow voice communications over the internet.</td>
</tr>
<tr>
<td>WAP</td>
<td>28,30,33,35,56,62,65</td>
<td>Wireless Application Protocol. A basic form of internet access through a mobile phone that is not capable of full internet access.</td>
</tr>
<tr>
<td>WDS</td>
<td>10,11,13,26,31,35,38,42,48,49,52,54,55,59</td>
<td>Wireless Data Services Global. A company that provides support and testing facilities to other organizations. Regarded as a leader of mobile device testing within the mobile market. Customers include HTC, Orange, T-Mobile, and Novatel, to name a few.</td>
</tr>
</tbody>
</table>
11. Appendix B - Some example use cases

Some example use cases are outlined here to show how DM acts throughout the lifecycle of a product;

**Initial device configuration**

**Trigger** – Customer purchases new device with wireless service  
**Action** – The device may not be pre-configured with network operator’s service parameters or personalization including:
   1. Data connection parameters  
   2. Browser/homepage settings  
   3. MMS service  
   4. OMA DM server account  
   5. Branded home screen  
   6. Applications  
   7. Specific menu structure and options

**Dependencies** - These may be specific to the type of user, so information may be required from user and content management systems to validate. Service parameters must be tested and known to work on the specific device model.

**Service parameter change or new service on the network**

**Trigger** – A network parameter is changed or a new network service is added  
**Action** – All devices with the incorrect parameter or without the new service settings should be identified and the new parameters automatically pushed to the device.  
**Dependencies** - Change may be limited to customers who subscribe to the particular service.  
Configuration of a third party email service  
**Trigger** – A customer wants to use their wireless device to check their existing email account hosted by another ISP  
**Action** – The email service parameters must be configured and activated on the device.  
**Dependencies** - Network Operator must have access to the information and knowledge to configure the email parameters for the third party ISP. This must take into account how outbound SMTP email is delivered - as the user is not connecting from the ISPs network. This may be through SMTP authentication (if supported by the device and the ISP), or by relaying through the network operator’s SMTP service.

**Customer requests a configuration change**

**Trigger** – Customer requests a configuration change or the addition of a new service.  
**Action** – The device must be updated with the new configuration, application or service parameters. Change should take effect in a suitable time frame for a support call or on a web
site.

**Dependencies** - Customer data may need to be checked or updated to ensure they are allowed access to the particular feature and are billed for it appropriately. A check must be made to ensure the new configuration is compatible with the customer’s device.

**Customer inserts a Smart Card into a foreign device**

**Trigger** – A customer puts a Smart Card (e.g. a SIM card) from Network Operator A into a device that was acquired from Network Operator B.

**Action** – The device must be updated with a new configuration to function on network A. This could provide new data service parameters, such as the data connection settings, but may also include an update to the home screen, branding and even the operating system firmware in line with network A’s standard build for the particular hardware platform. Management authority must transfer from network B to network A to facilitate the change.

**Dependencies** – The customer has agreed to the device being re-configured for the new network. There is no legal restriction on network A modifying a device that was previously under management control of network B. There is no subsidy lock on the device. The particular hardware is tested to work with the designated configuration on network A.

**Backup and restore**

**Trigger** – Many events trigger the requirement for a backup and restoration of a device configuration. This could be during the process of a hardware swap-out, or as a network service to protect data for a corporate customer.

**Action** – All service parameters, configuration settings, applications and user data should be read from the device to a secure network location.

**Dependencies** – Customer has agreed to personal data being stored by the network operator. A suitable security model exists around this data.

**Operating system update**

**Trigger** – The device manufacturer releases a new firmware build. This could be to fix a known issue or to provide a new feature.

**Action** – The new build must be tested against the network operator’s services and supported applications, and can then be installed on all devices with the previous firmware build. This may be executed on a scheduled basis to reduce the impact of delivering the updates to a large number of devices.

**Dependencies** – Knowledge of the new update’s compatibility with all potential services, applications and solutions will ensure the update is stable for all devices in the field. A backup and restore may be required to ensure all customer applications and data are unaffected by the update.
12. Appendix C – Technical Support Agent Survey

Please take a moment to help me evaluate the support agent’s view on customer attitudes. All answers will remain confidential. There are no trick questions. All answers will be used for statistics only, and not quoted.

### Service Quality

<table>
<thead>
<tr>
<th>On average, how many calls do you take in a day?</th>
<th>How would you rate the quality of your calls?</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ 51+</td>
<td>□ Consistent high quality</td>
</tr>
<tr>
<td>□ 31-50</td>
<td>□ Generally good</td>
</tr>
<tr>
<td>□ 11-30</td>
<td>□ Quality varies daily</td>
</tr>
<tr>
<td>□ 0-10</td>
<td>□ Poor quality</td>
</tr>
</tbody>
</table>

**What products do you support?**

- Mobile Phones and Smart Phones (exc. PDA's)
- PDA's
- Data Cards
- Data Modems
- Sync Software
- Other (Please Specify)

<table>
<thead>
<tr>
<th>How would you rate your technical knowledge?</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ High Knowledge</td>
</tr>
<tr>
<td>□ Generally good Knowledge</td>
</tr>
<tr>
<td>□ More Training Needed</td>
</tr>
<tr>
<td>□ Poor</td>
</tr>
<tr>
<td>What areas of your technical knowledge would you like to improve?</td>
</tr>
</tbody>
</table>

### Service and Environment

<table>
<thead>
<tr>
<th>How long have you worked as a support agent?</th>
<th>What do you think your average call handle time is?</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ 2 Years +</td>
<td>□ Less than 4 minutes</td>
</tr>
<tr>
<td>□ 1 Year – less than 2 Years</td>
<td>□ 4 to 6 minutes</td>
</tr>
<tr>
<td>□ 6 Months – less than 12 months</td>
<td>□ 7 to 9 minutes</td>
</tr>
<tr>
<td>□ Less than 6 months</td>
<td>□ More than 10 minutes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How would you rate the environment you work in?</th>
<th>On average, how often do you use the OTA (Over-the Air) tools? (e.g. WAP and MMS settings)</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Very Good</td>
<td>□ More than 20 times a day</td>
</tr>
<tr>
<td>□ Good</td>
<td>□ 11-19 times a day</td>
</tr>
<tr>
<td>□ Average</td>
<td>□ 1-10 times a day</td>
</tr>
<tr>
<td>□ Poor</td>
<td>□ Never</td>
</tr>
<tr>
<td>□ Very Poor</td>
<td></td>
</tr>
</tbody>
</table>

Rank from 1 (most important) to 8 (least important) what is most important to you on an average call.
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Call Handling Time
Customer Satisfaction
Solving the Problem
Empathy

Listening Skills
Logging the Call Correctly
Having Specific Product Knowledge
Remaining calm and non-aggressive

Additional Comments – Please use this section for anything else you think may be helpful. Remember this is not a survey of your company – only customer your own customer service.

Thank you for your participation!

13. Appendix D – Mobile Device User Survey Responses

Dissertation Survey

This survey has been designed to establish how you as a customer would like to be supported by the network operator or manufacturer when you have a problem with your mobile phone. Some of you may already have completed a survey from the technical support agent side, but you may still complete this one too.

Its a very quick survey, and most answers are multiple choice. Your identity will not be revealed, and all results will be used for statistical purposes only.

Any questions, please call me on 07766801330

Many thanks,

Victor Egbeni

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What age range do you fit into?
Under 16
17 – 20
21 – 25
26 – 29
30 +

Would you suggest you are a competent user of modern information technology?
Yes
No
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What phone do you own?

Who is your network operator?
BT Mobile
O2
Orange
T-Mobile
Tesco Mobile
Three
Virgin
Vodafone
Other (Not Listed)

Page 2 of 5

On a scale from 1 (poor) to 10 (excellent), how familiar are you with all of the functions your phone is capable of?
Ranged of values displayed

Have you read the manual for your current phone?
Yes
No

How many mobile phones have you owned in your lifetime?
1
2
3
4
5+

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Have you ever called a customer support line before?
Yes
No

If yes, was the problem solved during that single call?
Yes
No
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If yes, was the problem hardware of software related?
Hardware
Software
Both
Neither
Don’t Know

Have you ever needed to send your mobile phone away to be repaired?
Yes
No

Describe the worst customer support call you have made. Who was it to, what was the problem, and what did they do wrong?
Name of Company <Text Box>
Problem <Text Box>
What was wrong with the call? <Text Box>

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Have you ever received WAP (Internet) and/or MMS (Picture Message) settings ‘over-the-air’ in the form of text messages?
Yes
No
Don’t Know

Would you be willing to allow a customer service operator to remotely access your handset to help solve a problem?
Yes
No

Have you ever updated the firmware of your phone?
Yes
No

If yes, was this process easy for you to understand?
Yes
No

Page 5 of 5
Have you ever used the mobile internet service on your mobile phone offered by your service provider?
Yes
No

Have you ever used your mobile phone as a modem for your computer?
Yes
No

Have you ever used the mobile broadband services currently being offered by various service providers?
Yes
No

End of Survey.


The following tables directly link to the Data Analysis – Survey to Technical Support Agents section. It lists the workings of the ranking system used to establish which factors are considered most important in an average support call. The formula used to determine this ranking table is:

\[
\text{(Ranked Position } \times \text{ Amount of agents selected)} \div \text{ The total number of responses}
\]

<table>
<thead>
<tr>
<th>Customer Satisfaction</th>
<th>No. of Agents</th>
<th>Agent*Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranked 1</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Ranked 2</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Ranked 3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Ranked 4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Ranked 5</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Ranked 6</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Ranked 7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ranked 8</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Total Average Position**
2.3125

*Figure AC-1 - Working Out “Customer Satisfaction” Ranking*
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<table>
<thead>
<tr>
<th>Solving the Problem</th>
<th>No. of Agents</th>
<th>Agent Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranked 1</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Ranked 2</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Ranked 3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Ranked 4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Ranked 5</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Ranked 6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ranked 7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ranked 8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Average Position</strong></td>
<td><strong>2.5625</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Figure AC-2 – Working Out “Solving the Problem” Ranking*

<table>
<thead>
<tr>
<th>Listening Skills</th>
<th>No. of Agents</th>
<th>Agent Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranked 1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ranked 2</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Ranked 3</td>
<td>7</td>
<td>21</td>
</tr>
<tr>
<td>Ranked 4</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>Ranked 5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ranked 6</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Ranked 7</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Ranked 8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Average Position</strong></td>
<td><strong>3.625</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Figure AC-3 – Working Out “Listening Skills” Ranking*

<table>
<thead>
<tr>
<th>Remaining Calm</th>
<th>No. of Agents</th>
<th>Agent Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranked 1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ranked 2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Ranked 3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ranked 4</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Ranked 5</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Ranked 6</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Ranked 7</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Ranked 8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Average Position</strong></td>
<td><strong>4.0625</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Figure AC-4 – Working Out “Remaining Calm and Non-Aggressive” Ranking*

<table>
<thead>
<tr>
<th>Product Knowledge</th>
<th>No. of Agents</th>
<th>Agent Ranking</th>
</tr>
</thead>
</table>

Dalarna University
Röda vägen 35-781 88
Borlange Sweden
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Ranked 1 0 0
Ranked 2 2 4
Ranked 3 1 3
Ranked 4 3 12
Ranked 5 3 15
Ranked 6 4 24
Ranked 7 2 14
Ranked 8 1 8

Total Average Position 5

Figure AC-5 – Working Out “Having Specific Product Knowledge” Ranking

<table>
<thead>
<tr>
<th>Logging the Call</th>
<th>No. of Agents</th>
<th>Agent*Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranked 1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ranked 2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ranked 3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Ranked 4</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Ranked 5</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Ranked 6</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Ranked 7</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>Ranked 8</td>
<td>1</td>
<td>8</td>
</tr>
</tbody>
</table>

Total Average Position 5.5

Figure AC-6 – Working Out “Logging the Call Correctly” Ranking

<table>
<thead>
<tr>
<th>Empathy</th>
<th>No. of Agents</th>
<th>Agent*Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranked 1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ranked 2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Ranked 3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Ranked 4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ranked 5</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Ranked 6</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Ranked 7</td>
<td>5</td>
<td>35</td>
</tr>
<tr>
<td>Ranked 8</td>
<td>5</td>
<td>40</td>
</tr>
</tbody>
</table>

Total Average Position 6.125

Figure AC-7 – Working Out “Empathy” Ranking

<table>
<thead>
<tr>
<th>Call Handling Time</th>
<th>No. of Agents</th>
<th>Agent*Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranked 1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ranked 2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Ranked</th>
<th>Position 1</th>
<th>Position 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranked 3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Ranked 4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Ranked 5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ranked 6</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Ranked 7</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>Ranked 8</td>
<td>9</td>
<td>72</td>
</tr>
</tbody>
</table>

**Total Average Position 6.8125**

*Figure AC-8 – Working Out “Call Handling Time” Ranking*
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<table>
<thead>
<tr>
<th>Position</th>
<th>Option</th>
<th>Average Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Customer Satisfaction</td>
<td>TOTAL 2.3125</td>
</tr>
<tr>
<td>2</td>
<td>Solving the Problem</td>
<td>TOTAL 2.5625</td>
</tr>
<tr>
<td>3</td>
<td>Listening Skills</td>
<td>TOTAL 3.625</td>
</tr>
<tr>
<td>4</td>
<td>Remaining calm and non-aggressive</td>
<td>TOTAL 4.0625</td>
</tr>
<tr>
<td>5</td>
<td>Having specific product knowledge</td>
<td>TOTAL 5</td>
</tr>
<tr>
<td>6</td>
<td>Logging the Call Correctly</td>
<td>TOTAL 5.5</td>
</tr>
<tr>
<td>7</td>
<td>Empathy</td>
<td>TOTAL 6.125</td>
</tr>
<tr>
<td>8</td>
<td>Call Handling Time</td>
<td>TOTAL 6.8125</td>
</tr>
</tbody>
</table>

Figure AC-9 – Important Factors in Support calls

15. Appendix F – Mobile Device User Survey Support Centre Experiences
For decency and presentation purposes, some answers have been modified. These instances are clearly indicated by **bold** text.

12. Describe the worst customer support call you have made. Who was it to, what was the problem, and what did they do wrong? : **What was wrong with the call?** (30 total)

1. (202468) I had just had an upgrade and the sim was incorrect. When they sent me the new one they ported my account to an alternate system which decided i had no new sim and re-enabled the old sim. took 3 phone calls for this to be identified

2. (202489) The gentlemen on the other end sounded fed up, was not very enthusiastic and overall gave a bad impression

3. (202396) Would not listen to my complaint or the description of what the problem was.

4. (202501) I have never really made a customer service call that did not have a satisfactory result.

5. (202505) Repeatedly no one answered the phone.

6. (202507) i was transferred from department to department, was kept on hold for ages and what could have been done in 5 minutes took over half an hour.

7. (202409) Poor people at the end of the line who didn’t understand

8. (202516) I just kept being put on hold and passed on to another department and then after being on hold the line would get cut off!
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<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>(202432)</td>
<td>They were rude</td>
</tr>
<tr>
<td>10</td>
<td>(202618)</td>
<td>the person was very helpful, but o2 have some stupid procedures which mean you have to speak to about 10 different people to get anywhere</td>
</tr>
<tr>
<td>11</td>
<td>(202704)</td>
<td>On calling them with my complaint they failed to understand my problem as there computer data base had 'gone down', which therefore meant data had been erased from the system. This included all track record of my account being charged too many times!!</td>
</tr>
<tr>
<td>12</td>
<td>(202720)</td>
<td>I spoke to their outsourced Indian customer service once, and I remember not understanding what the person was saying and him forwarding me to different departments making the process too lengthy. However O2 usually have excellent call centre service with their UK reps.</td>
</tr>
<tr>
<td>13</td>
<td>(202534)</td>
<td>Inappropriate Response</td>
</tr>
<tr>
<td>14</td>
<td>(202525)</td>
<td>Support staff were rude and unaware of policies</td>
</tr>
<tr>
<td>15</td>
<td>(202540)</td>
<td>N/A</td>
</tr>
<tr>
<td>16</td>
<td>(202543)</td>
<td>it took two attempts to get through, waiting 45mins each time, only to be told as its the weekend they cant help me, as the dept dealing with activating accounts is closed</td>
</tr>
<tr>
<td>17</td>
<td>(202551)</td>
<td>They stated that as long as picture MMS was working then MMS was functioning and that they did not have the technical ability to fix the problem I stated.</td>
</tr>
<tr>
<td>18</td>
<td>(202557)</td>
<td>Person on the line was rude and had no idea what they were talking about.</td>
</tr>
<tr>
<td>19</td>
<td>(202588)</td>
<td>took ages, had to speak to many different people</td>
</tr>
<tr>
<td>20</td>
<td>(202604)</td>
<td>was given conflicting information by two separate people on two separate calls and they still didn’t deliver tickets</td>
</tr>
<tr>
<td>21</td>
<td>(203065)</td>
<td>said they couldn't tell me anything about my wages because they couldn't discuss them</td>
</tr>
<tr>
<td>22</td>
<td>(203148)</td>
<td>The agent was stupid and was like i had to switch cards and couldn’t top up for another 24 hours but acted arrogantly and said she would lend me 2 pounds which got me 3 texts to England. Instead I signed up with</td>
</tr>
</tbody>
</table>
Vodafone instead of yes optus (T Mobile Aus) when i got my new phone.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>I was constantly thrown between &quot;standard&quot; customer services in India and the management customer services in the UK. This happened about 6 time before I hung up.</td>
</tr>
<tr>
<td>24</td>
<td>THE 'ADVISER' TOLD ME THAT I WAS UNABLE TO GET A NEW TARRIFF AS I WAS AN EXSISTING CUSTOMER AND THE DEALS WERE ONLY FOR NEW CUSTOMERS. I THEN WANTED TO CANCEL MY CONTRACT WITH THEM AS I WAS OUTRAGED AS I HAD BEEN A CUSTOMER FOR OVER 4 YEARS AND IT WOULD HAVE COST ABOUT £100, SO IM WAITING TIL THE END OF MY CONTRACT AND WILL NOT BE USING O2 AGAIN</td>
</tr>
<tr>
<td>25</td>
<td>they were rude and not very helpful considering their product was faulty.</td>
</tr>
<tr>
<td>26</td>
<td>They refused to acknowledge that I had not been notified of a change of plan and were rude and unhelpful.</td>
</tr>
<tr>
<td>27</td>
<td>They didn’t want to listen</td>
</tr>
<tr>
<td>28</td>
<td>The advisor didn't actually answer my question.</td>
</tr>
<tr>
<td>29</td>
<td>passing me on to other agents</td>
</tr>
<tr>
<td>30</td>
<td>Lack of communication between those who spoke to me regarding my O2 phone bill leading to me getting charged 3 times for the same bill.</td>
</tr>
</tbody>
</table>

The opinions expressed in Appendix F represent only the opinions of the anonymous users who filled in the survey in Appendix E. These opinions do not represent the view of the author or Högskolan Dalarna University in any way.