

CeADAR – Centre for Applied Data Analytics Research
Enterprise Ireland Data Analytics Technology Centre

State of the Art in Proactive Data Aggregation Tools

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ABSTRACT

This document provides a review of proactive Data Aggregation tools as deployed with and used within customer contact centre software. We focus on the application of proactive data aggregation to CRM solutions and examine the evolution of CRM solutions from pure database front ends towards sales solutions that provide integration with social analytics, context sensitive suggestion systems, and text-analytics integration. We examine a number of Case Studies and relate current vendor trends to basic research in related fields.

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CeADAR is a research partnership comprising University College Dublin, University College Cork, and Dublin Institute of Technology.

<http://www.ceadar.ie>

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1 Introduction

CeADAR Theme 1.4 concerns the investigation and development of *Passive Analytics* methods and tools that can be used to deliver relevant data analytics results to users within their normal daily work activities. Unlike conventional analytics solution development or deployment such as Business Intelligence applications, the provision of passive analytics is a secondary task to the user's primary activity, rather than an activity that the user is actively engaging in. As such, with passive analytics we aim to provide users with timely and useful information to help them perform their existing tasks better. While rarely referred to as such, there are already a wide variety of everyday applications which we might view as incorporating passive analytics. For example in the consumer domain the passive underlining of frequently highlighted text on the Amazon Kindle can be seen as a simple form of Passive Analytics. Similarly, context sensitive assistance systems within consumer software products provide users with tips on how to complete specific jobs. Such instructions can be discarded or used by users as appropriate.

In this document we look specifically at the state of the art in Proactive Data Aggregation Tools. We take this tool set to be a specific case of the more general class of Passive Analytics applications referenced above. Rather than focusing on a very wide range of tools, we investigate those tools and techniques which have been developed to proactively gather and provide aggregated information to the business user based on enterprise databases. We have specifically selected the domain of Consumer Relationship Management (CRM) and customer contact centre software for investigation as this domain can benefit greatly from the passive provision of key customer and context insights in time critical service and sales situations.

We will proceed in Section 2 with a number of Case Studies followed by an analysis of key trends and recommendations on Proactive Data Aggregation Tools in subsequent sections.

2 Case Studies

2.1 SmartPoint

SmartPoint¹, currently developed by Kerridge Commercial Systems in the UK, is an information integration technology framework that allows information from a wide range of back-end data systems to be accessed simultaneously in providing key context information to sales and service agents. The primary aim of the platform is thus to "deliver relevant information" from multiple applications to a service or sales agent's desktop in a well organized and consistent fashion. As we will see, such an information integration method is a common theme amongst CRM tools as they aim to move users away from a cluttered desktop where a number of enterprise software applications are required to run in parallel.

From a passive analytics standpoint, the key feature of SmartPoint is that it provides a customizable dashboard to provide assistance information to business agents as they perform frequent business activities. These dashboards, assembled out of a widget format referred to as SmartParts, can be implemented as standalone windows that share an agent's desk-

¹<http://www.smartpointsoftware.com>

top, or can instead be integrated into a range of applications - including existing CRM and Enterprise Resource Planning (ERP) systems - through Active-X component integration.

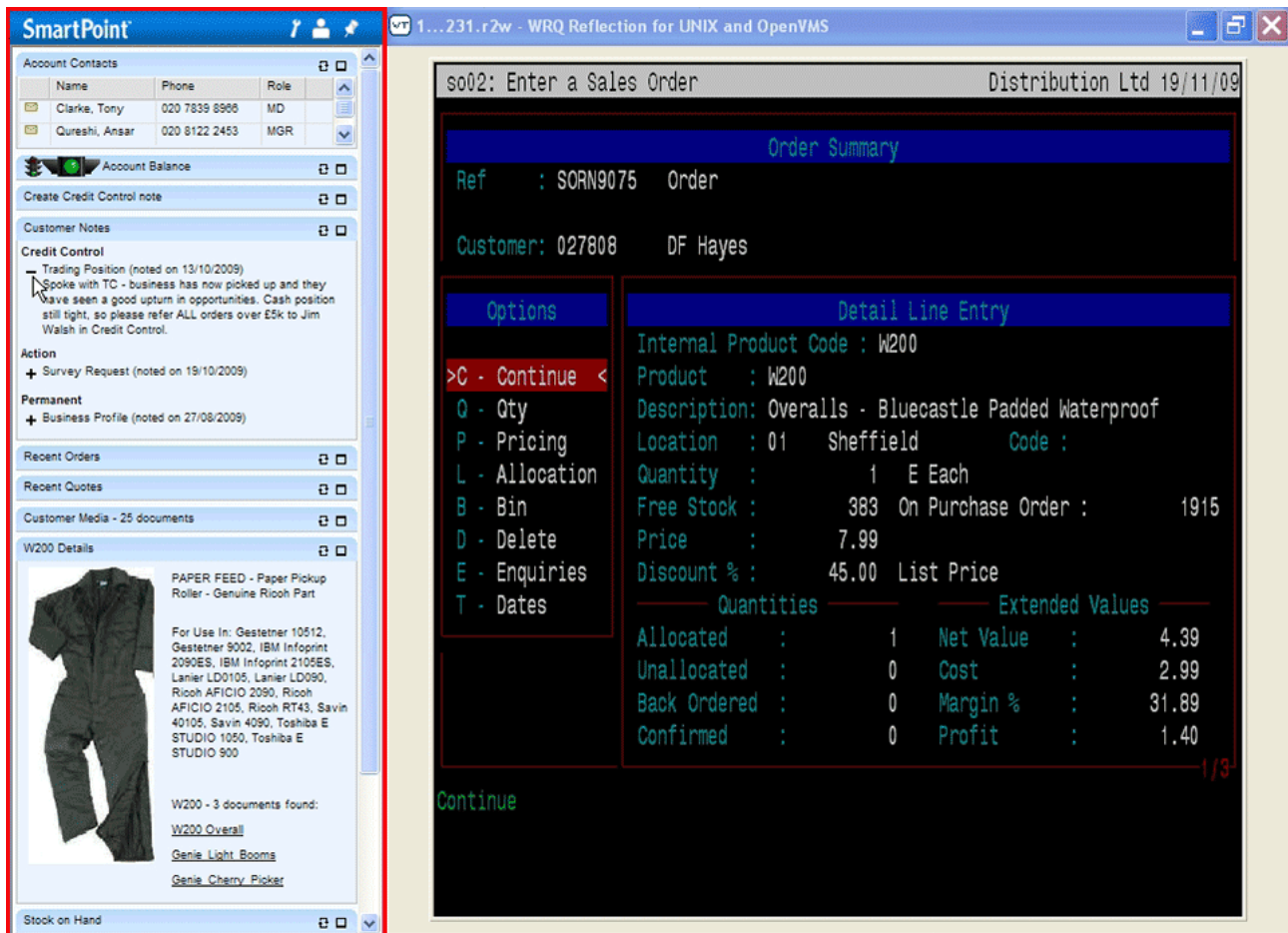


Figure 1: SmartPoint Deployment with Existing Enterprise Software

SmartParts are designed to be aware of the specific task being performed by the business agent in legacy software and to then provide appropriate assistance at that time to the agent. The SmartPoint developers refer to this ability as "Active Intelligence". Information to be delivered in the SmartPart can be pulled from a number of sources, but in any case the aim of the SmartPart is to provide information in a consistent way that is relevant and only displayed when required. In principle SmartPoint can access a range of data sources including existing enterprise software, document management systems, unstructured information including Microsoft Office documents and emails, and the contents of Data Warehouses. Figure 1² illustrates the intended use of SmartPoint's SmartParts as standalone applets which share the desktop with existing enterprise software. The SmartPart on the left provides the employee with context sensitive information based on the specific task that they are performing in legacy software (on the right). The SmartPart technology can be implemented to provide this information customized to fine grained field specific information.

In practice SmartPoint software must be implemented for a given application and deployment through the development of SmartParts with respect to the target application on one

²All screenshots used in this report are adapted from promotional materials or other non-sensitive sources of information. Copyright remains with the copyright owner.

hand and available information sources on the other. One stated advantage of SmartPoint is that the individual SmartParts can be created by technical users within the organization to which the software is being deployed.

SmartPoint software fulfills a key feature of passive and pro-active analytics software - it passively provides useful information to sales agents as they perform routine tasks. The main drawback to SmartPoint technology is however the very rigid nature of information which can be provided to the enterprise employee. SmartParts are custom designed and hard-coded to provide specific information to employees while performing specific tasks. There is little analytics or aggregation in the information provided, and it is unclear whether any effort has been made to integrate true data or text analytics technologies. Nevertheless, SmartPoint serves as a useful example of pro-active information presentation in the CRM domain.

2.2 KANA

KANA is a developer and range of software for deployment in Customer Contact Centres. Unlike SmartPoint, KANA software is in itself CRM software rather than a secondary product that is intended to be integrated with existing enterprise applications. For our purposes the central feature of the KANA suit is the KANA Agent Desktop³. The Agent Desktop provides an integrated CRM interface which can draw together information from a range of sources and makes use of text analysis solutions to provide agents with useful information during sales and service situations. As is common in a number of CRM solutions, KANA provides integration across a range of different communication channels onto the single Agent Desktop. Specifically, KANA aims to integrate a customer's interaction with the company across websites, email, chat, social media and phone into a single experience and information stream for both the customer and the agent.

As a CRM system KANA aims to differentiate itself from competitors through the delivery of key information to company employees without requiring them to engage in individual searches or tabbing between applications. For example, if a customer calls about an invoice, key information relevant to that customer, e.g., up-sell opportunities and case history, is displayed to the agent (See Figure 2 for an illustration of the interface presented to the agent). While more integrated than the solution provided by SmartPoint, this is very similar functionality to that provided with SmartPoint. However, where KANA truly differentiates itself from some CRM providers is through a cleaner integration of structured and unstructured information. Taking KANA's email management system as a case in point: if an email is routed to a given agent, the interface that the agent sees provides a range of information on the customer and the situation at hand. Not only does this information include customer details, customer worth metrics, but also includes information on open cases and suggested solutions to the customers problems through information retrieval based analysis of the customer's email against a specified knowledge base.

As the stated aim of KANA is to minimize agent searches and tabbing between applications and provide context relevant information to agents at the relevant moment, KANA Enter-

³<http://www.kana.com/agent-desktop/stack.php>

The screenshot displays the KANA Enterprise interface for a customer named Dan Cronin (#2124). The interface is divided into several sections:

- Header:** Shows the user's name (Mr. Dan Cronin), a search bar, and system status (Available 00:00:36).
- Customer Profile:** Displays the customer's name, ID (#2124), email (d.cronin@kanamail.com), phone number (0777 981 0414), and address (134 Macklespackie Drive, Putterington-upon-Thaemes, Heartfordshire, HF4 9JJ, UK). It also includes buttons for 'Open Case' and 'SLA Breach'.
- Products:** Lists four product categories:
 - Broadband:** Package: Large, Status: Intermittent Fault, Usage: Moderate-Heavy, Last Bill: 21st July.
 - Mobile:** Package: Medium, Handset: Samsung Galaxy S2, Usage: Heavy, Last Bill: 21st July.
 - Landline:** Package: Evenings and Weekends, Status: Good, Usage: Light, Last Bill: 21st July.
 - TV:** Status: Upsell Opportunity, View package comparison, Purchase.
- History:** Shows recent interactions:
 - Customer submitted an Acme Phone Insurance Claim form. (Today)
 - Webchat with one of our agents, George Lambert. (14th June)
 - Asked the question: "How do I retrieve voicemail messages?" (11th June)
- Upsells:** Lists recommended products:
 - Samsung Galaxy 3 Handset: Available on £29 pm Plan, View product specification, Purchase.
 - Broadband Super: 100MB Speeds (£32pm), View package comparison.
- Right-hand Panel:** Contains search results for various topics, including 'Maximizing battery usage on Samsung Galaxy S2', 'Why is my mobile bill so high?', and 'How long does a phone insurance claim take?'. It also features a 'Launch Script' button.
- Left-hand Sidebar:** Includes navigation options like 'Identify Customer', 'Knowledge Base', 'Process Insurance Claim', and a 'Tasks' section with buttons for 'Call', 'Case History', 'Compose Email', 'Customer Profile' (highlighted), 'Edit Customer', 'Interaction History', 'Process Insurance Claim', 'Send Letter', and 'Send SMS'.

Figure 2: KANA Enterprise Interface.

prise fits well with the model of pro-active tools and passive data analytics. Nevertheless the range of information available to the sales or service agent does not go beyond a range of standard CRM information categories that have traditionally been available to agents with only one or two mouse clicks, e.g., up-sell opportunities or case histories.

2.3 Salesforce.com

Salesforce.com has been a pioneer in cloud based deployment of enterprise software including CRM solutions over the past decade. While Salesforce have largely led a move towards cloud deployment and highly integrated solutions development, the actual features included in Salesforce CRM have large overlap with those from other providers in the CRM solution space.

With respect to the pro-active provision of key information to sales and service agents, Salesforce includes features to provide key information summaries to agents on incoming queries in a manner that is very similar to that provided by KANA. The provision of key information to a service or sales agent is by way of a "screen pop". This is an information card that is displayed to the agent while a call is being initiated by a client. The Salesforce Screen Pop includes standard customer history information such as customer service level agreements, access to case histories, and can point agents towards knowledge base articles which may be relevant to the customer's issue.

One way in which Salesforce has recently differentiated itself from a competitor like KANA in the passive analytics feature space is through the inclusion of social media analytics in Screen Pops when dealing with users who are active and identifiable on social media. This

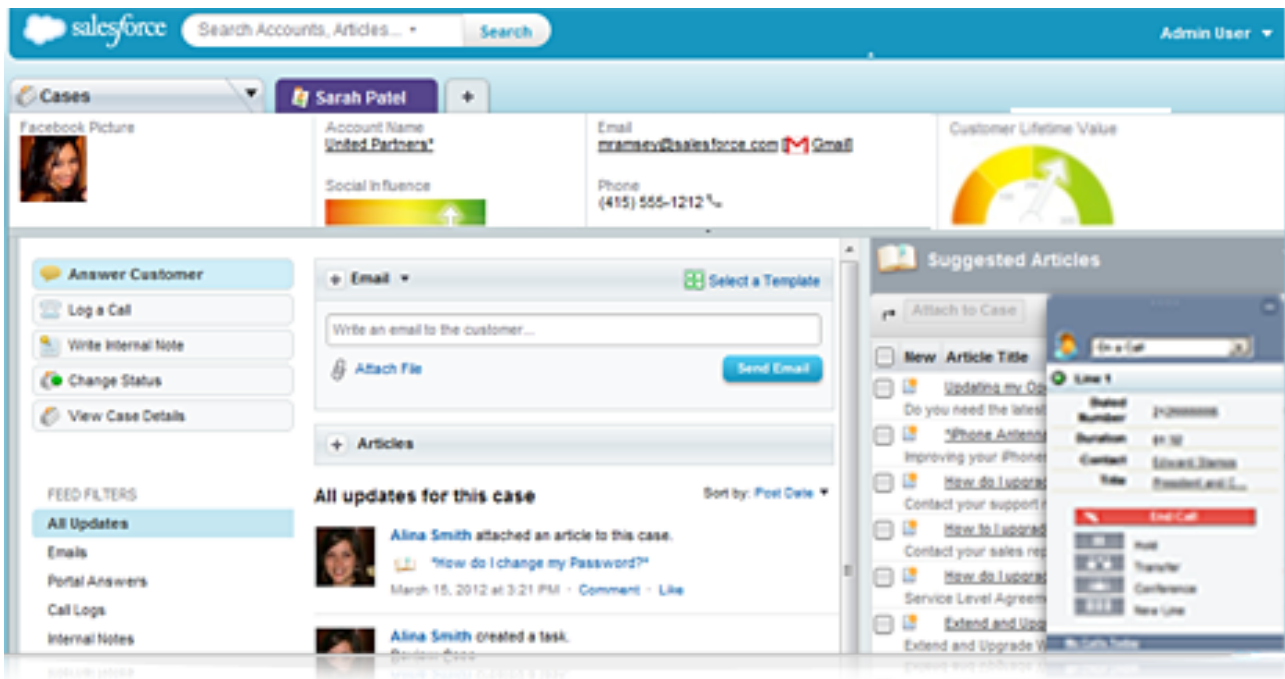


Figure 3: Salesforce.com Screen Pop including Social Media Analytics.

is illustrated through Figure 3 where a customer specific social media metric is included through dashboard widgets at the top of the Screen Pop. Here we can see that specific metrics for Social Influence are displayed in proximity to more traditional metrics such as Customer Lifelong Value.

2.4 Amdocs

Amdocs is a large player in the CRM industry which has in recent years attempted to differentiate itself from others through the inclusion of analytics and *intelligent* features into their contact centre products. This can be seen for example in Amdocs Intelligent Agent Desktop product. The Intelligent Agent Desktop attempts to make a service or sales agent's task as straightforward as possible by providing key overview information as well as context specific suggestions on actions which can be taken by the agent (See Figure 4). Overview information is provided through four information panels that are available at the top of the Intelligent Agent Desktop. These four panels include summary data on Customer Information; Price Information; Billing Information; and, Price Plan Information. Meanwhile along the left panel the agent is presented with a number of dynamically suggested quick actions based on the most popular or important processes that have been deemed relevant for the particular customer context.

The most interesting feature of Amdocs customer support platform is the Amdocs Insight Engine⁴ and its use in providing Proactive Care to customers. Similar in part to a fault prediction technology, the Amdocs Insight Engine analyses situations in which a customer has suffered a problem and attempts to determine the root source of the problem such that the

⁴<http://www.amdocs.com/Products/Customer-Management/proactive-insight/Pages/proactive-care.aspx>

problem can be proactively addressed. This is achieved by first building and maintaining a context model for a user based on as complete a data history as possible. If a problem is detected on the user's device or with an account for example, the Amdocs Insight Engine attempts to suggest a solution based on the problem detected and the complete users model. The stated aim of this problem solving implementation is truly proactive on the system's part in that the aim is to have a solution in place for the user before the user is even fully aware of the problem. With a solution in place, communication can either be directly initiated with the customer to solve the problem or the solution can instead be used to drive customer agent interaction through the Amdocs Intelligent Desktop.

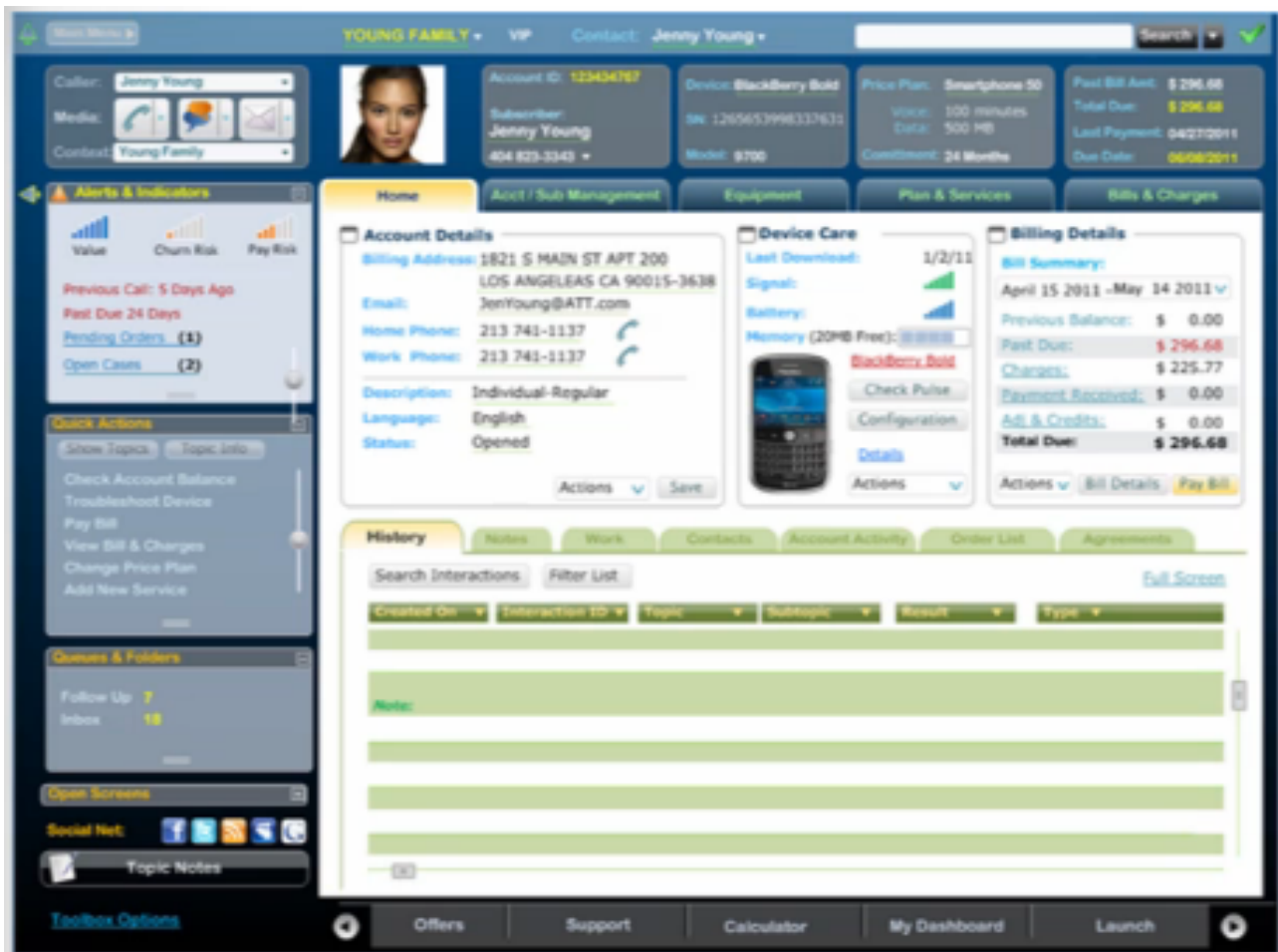


Figure 4: Amdocs Intelligent Agent Desktop.

While little practical data is available on the success or otherwise of this solution in deployment, the inclusion of proactive error detection, solution and delivery to the service agent featured in the Amdocs platform indicates an interesting potential path for future CRM development.

2.5 Others

The CRM and contact centre software markets are extremely large and have a number of sizable players not mentioned above. These include Microsoft's Dynamics CRM, Sage CRM, SugarCRM, and Oracle's CRM solutions which include acquisitions such as Siebel and Peo-

pleSoft. Most of these players are developing or deploying increased analytics support to their software as the market moves in this direction. For example, while Microsoft's Dynamics CRM product has limited context-sensitive intelligent information delivery to agents, Microsoft have recently announced the acquisition of Netbreeze, a Swiss social media analytics and monitoring solutions provider, which specializes in social consumer relationship management. Based on this it would not be surprising to see Microsoft integrate Netbreeze's strengths in social monitoring analysis with Dynamics CRM.

In addition to pure CRM software, the application of passive analytics can also be seen in the related customer service domain of call tracking and monitoring software. For example, the Interactive Analytics product from NICE⁵ provides real time monitoring of calls which can be used to set up triggers to notify supervisors of when certain key words have been spoken by customers. Supervisors can then if necessary step into the interaction to provide support to the sales agent. Similarly other speech related characteristics such as tone changes or relative amplitude changes can be used to detect problem situations with callers or monitor the relative success or otherwise of customer-agent interactions.

3 Related Technologies

Beyond the Customer Relationship Management and Customer Care Solutions domain there are a wide variety of situations and software solutions which we might broadly class as coming under the heading of passive analytics or pro-active analytics tools. In this section we briefly make reference to these to place our CRM centric review in context.

Arguably one of the earliest and best known passive analytics applications is the Office Assistant which was bundled with Office 97 and a number of subsequent Microsoft Office products. Often referred to as Clippy - the name of the default avatar - the Office Assistant attempted to provide assistance to the user to complete a range of tasks which were supported by a help wizard. While the Office Assistant is notable in a positive light as being an early deployment of machine learning techniques in a Microsoft consumer product, the Office Assistant was widely criticized with a notable backlash against the product. It is worth noting however that the reasons for the failure of this product are generally not perceived as stemming from the existence of context sensitive help - instead the problem is believed by some to be due to the intrusive and personified manner of the assistance delivery [9]. Considerable more success has subsequently been had with non-anthropomorphic and non-"cutesy" assistance systems.

The pro-active provision of recommender results across e-commerce and other online services are a frequent and important example of passive data analysis in our daily lives [7]. For example customized online adverts, e.g., Google adwords, in email clients or strategically placed within webpages aim to proactively deliver information to the user based on the context of their current activities. Underlying technologies in the recommender domain such as collaborative filtering provides a useful foundation for information filtering and provision to agents in the CRM domain which we are principally concerned with here. For example, context sensitive recommender systems (see [1]) provide a framework on which context sensitive

⁵<http://www.nice.com/interaction-analytics>

information recommendations can be presented to sales and service agents.

Activity Recognition as frequently applied in ambient intelligence applications can also be interpreted as an example of passive analytics. Activity recognition is the process of automatically identifying an activity being performed by an agent through analysis of the low-level actions performed by that agent in a given context. While research in the area of Activity Recognition may be traced to earlier work on Plan Recognition which relied on fragile inferential and graph matching techniques, recent work on Activity Recognition has moved towards reasoning based on conventional machine learning techniques such as Hidden Markov Models [6], Naive Bayes Classifiers [8], and Support Vector Machines [2]. Activity recognition has a wide range of applications. These applications include identifying security threats [4], modeling navigational strategies [3] or providing computer mediated human-human crisis collaboration [5]. In all cases the aim of each application is to use activity hypotheses to generate and supply useful information to users to help the user complete their activity more effectively. As with recommender systems, the technologies underlying Activity Recognition are directly relevant to the development of proactive analytics tools for the CRM and contact centre assistance domain.

4 Analysis & Trends

Call-centre directed CRM solutions have in the last decade moved away from a cluttered desktop towards a single integrated desktop which attempts to provide the right information to the sales or service agent at the right time. While this has been a ubiquitous theme, the differentiating factors between vendors have come from the mechanisms that have been applied by vendors to capture and provide this *right* information to the agent at the right time. In this section we will briefly review the most important passive analytics related developments seen across the various vendors.

Beyond the removal of clutter and tabbing between applications, the most common theme seen amongst the CRM solutions has been the provision of traditional Business Intelligence components such as dashboards and widgets to allow the customization of agent desktops with context information. The goal here is to provide activity specific access to key customer information. While most vendors include this in part, some vendors such as SharePoint focus on this as a unique selling point - particularly with respect to facilitating integration with a wide variety of legacy systems. It is worth noting that the information displayed to the service or sales agent need not be simply a view on the customer's contact information, but may include important analytic information such as customer lifetime value or churn propensity.

Another analytics theme common across a range of CRM solutions is the shift towards integration with Social Media. Whether it is Microsoft's recent integration with the enterprise social media platform Yammer, or the monitoring of social campaigns across Twitter or Facebook, the importance of social media integration is now accepted. It is worth noting that this integration already goes further than simply including social media as a new interaction medium in that companies such as Salesforce.com are beginning to gather metrics such as a customer's social influence.

Another important theme has been the integration of structured and unstructured data anal-

ysis on the agent’s desktop. Vendors such as KANA and Amdocs have both realized the importance of information retrieval and text mining in attempting to provide solution suggestions to their agents. While this is not a very recent trend, the further incorporation of unstructured data analytics into the agent desktop is likely to provide a rich vein of research and development whilst improving information access for the sales or service agent.

While there have been a number of developments in the CRM space that have directly or indirectly included proactive data aggregation into the agent’s desktop environment, there remain a number of challenges yet to be met. Most significantly, while the desktop has been de-cluttered in that multiple applications have been replaced with a single interface, that replacement interface is frequently bloated and “busy”. There remain a large number of information fields for the agent to search through, and there are opportunities to simplify or restructure the desktop such that prominence is placed on the most important information in a given context. Analytics can be a key tool in determining just which information should be made prominent to the agent.

With respect to the inclusion of specific analytics results on the desktop, there are still numerous limitations in terms of what information is provided to the agent. While Salesforce.com and others do for example now include a Customer Lifetime Value metric, there is considerable scope for inclusion of further metrics which should be weighted by their context specific importance. Moreover, with respect to partially structured and unstructured information, there is considerable scope for analysis and partial summary of customer history. Currently case information is available to agents but this history must be read by the sales or service agent. Quick text based or data point based summarization will prove extremely useful for both open and closed case summary for the agent.

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