A Mobile Support System for Collaborative Multi-Vendor Sales Processes

Jochen Kokemueller  
*Fraunhofer Institute for Industrial Engineering, jochen@kokemueller.de*

Holger Kett  
*Fraunhofer Institute for Industrial Engineering, holger.kett@iao.fraunhofer.de*

Oliver Hoess  
*Fraunhofer Institute for Industrial Engineering, oliver.hoess@iao.fraunhofer.de*

Anette Weisbecker  
*Fraunhofer Institute for Industrial Engineering, anette.weisbecker@iao.fraunhofer.de*

Follow this and additional works at: [http://aisel.aisnet.org/amcis2008](http://aisel.aisnet.org/amcis2008)

**Recommended Citation**

[http://aisel.aisnet.org/amcis2008/161](http://aisel.aisnet.org/amcis2008/161)
A Mobile Support System for Collaborative Multi-Vendor Sales Processes

Jochen Kokemüller, Holger Kett, Oliver Höß, Anette Weisbecker

Fraunhofer Institute for Industrial Engineering
Nobelstr. 12, 70569 Stuttgart

ABSTRACT

Vendors that foster their customer relationships via internal sales agents can choose from a broad range of customer relationship management systems. Independent sales agencies on the other hand do not have such a choice. The results from two studies presented in this paper indicate that these sales agencies would benefit from mobile applications with end-to-end multi-vendor support. Especially the areas of customer care, product choice support, customer requests and order tracking could benefit. In this paper a system is proposed that meets the needs of sales agents on the road and in the back office, as well as the needs of the vendors. It provides seamless process integration, with direct mobile access to important information and enables post processing and commission tracking in the back office. The system consists of a web-based server application and mobile clients connected via web-services, thereby realizing a mobile service oriented architecture.

Keywords

Mobile sales support, customer relationship management, design science, independent sales agencies, transactional platform, sales force automation, master data management

INTRODUCTION

Sales agents depend on mobile support systems for their daily work. In the food industry sales agents use to visit supermarkets carrying highly integrated mobile devices that allow order processing and barcode scanning. These devices significantly improve the productivity of the sales agent (Walker and Barnes 2005). Usually these systems are connected to a customer relationship management (CRM) or enterprise resource planning (ERP) system at the vendor’s site. Large companies with central IT management and a strategic commitment are able to facilitate this kind of mobile support. Due to the size of these companies and their common processes, they can choose from a broad range of systems to support them.

Independent sales agencies (ISAs), however, have needs that differ substantially from those of companies with integrated sales departments. Our hypothesis is that ISAs would largely benefit from support by Information Systems (IS) technology and that there is a need for mobile support (Figure 1). This includes mobile access to last minute information, documentation duties of both suppliers and ISAs and transactional access to distributed backend systems (Haller et al. 2002). In this work the results from two surveys are presented to underline this assumption. Later requirements, for an IS artifact, are derived. We show that the IS artifact has to address a highly heterogeneous environment while still being reasonable economic. To our knowledge solutions that satisfy both needs are currently not present on the market. Therefore, systems that solve the problems of typical small ISAs still bear large opportunities both in research and on the market. In this work we propose an IS artifact based on a service-oriented architecture as the integration layer in conjunction with comprehensive mobile and web-based interfaces.

We begin with a review of the relevant literature. Then we focus on sales processes found in small ISAs in the following section and present the results of two surveys we conducted. Based on these results we present requirements for a mobile sales support system, before we conclude our findings.
RELATED WORK

Over the last years mobile applications and services have been extensively researched. Ngai and Gunasekaran (2007) provide a review of this research, which also includes mobile middleware. However, none of the discussed papers covers the topic of mobile service oriented architecture (mSOA). As the paradigm of service oriented architecture (SOA) has great effect on stationary IS it is consequently important to discuss the needs of mobile applications as parts of a SOA. Especially the use of Web Services from mobile devices faces several challenges (Pilioura et al. 2003). Bandwidth and the strongly correlated execution time of Web Services called by wireless devices can be addressed by improving protocols and asynchronous communication (Pilioura et al. 2007). An important prerequisite for the success of m-commerce is to ensure that the customers’ experience, via the user interface, satisfies both their sensory and functional needs (Venkatesh et al. 2003).

Since the m-commerce market is moving rapidly it is important to know, what is targeted by a mobile IS artifact. A concise taxonomy can be very helpful in identifying the relevance of a mobile application. Nickerson et al. (2007) propose a scheme with seven dimensions. In that scheme our IS artifact classifies as synchronous, interactional, transactional, public, group, non-location-based and identity based. While the taxonomy is sufficient in most parts, we propose an additional category in the multiplicity dimension. More precisely, the taxonomy does not distinguish between synchronous and asynchronous interaction between users. Refining the dimension to individual, collaboration and interactive would help to identify if there is in-time communication between the users apart from the communication with the system itself. Whereas a mobile game could qualify as interactive, the presented IS artifact falls into the category of collaboration while the temporal category still is synchronous.

Buehrer et al. (2005) have shown that the sales forces makes use of IS if it improves their productiveness. To our knowledge there has been very little research in the area of ISAs on that behalf. In particular we were unable to identify any work that focuses on the aspect of mobile sales support systems for ISAs. As a result the presented research could not base itself on already existent theories or behavioral models.

METHODOLOGY

We chose the design science approach proposed by Hevner et al. (2004). In the beginning the needs of the target group are explored and later on an IS artifact is designed, which we will evaluate with the target user group.

To obtain a first understanding of the principal modes of dealing we started with a qualitative survey. In five interviews and a one focus group with five participants distinct from the ones of the interviews their behavior and principal problems were explored. In total eight ISAs and two manufactures participated in that survey. These findings are presented as explorative findings in the next section.

In the second step we verified the explorative findings with a quantitative survey. To that end a questionnaire was sent to 1,800 ISAs in Baden-Württemberg, Germany. The verified results are presented as survey results.
Knowing the verified needs of the target group we were then able to deduce requirements an IS for ISAs has to fulfill. Using those requirements we give some thoughts what an IS artifact should look like in order to get acceptance in the target group.

COLLABORATIVE MULTI-VENDOR SALES PROCESSES

A fast return of investment is of major importance for small companies. It appears that missing liquidity is a major obstacle in enhancing their productivity through IS. This topic has to be addressed by an intelligent business model. Regardless the use of IS to enhance sales performance is embraced by sales representatives (Schillewaert et al. 2005).

Together with the ISAs several processes could be identified as being insufficient. Eminent are those integrating the ISAs with their respective suppliers. Most participants articulated deficits in the processes mentioned below. Indeed most are done manually and most would benefit from mobile support:

**Explorative-Finding I:** Requests for quotations are traditionally processed by the sales agent on paper and mailed to the supplier. The supplier then inserts them into his IS.

**Explorative-Finding II:** Invoices and orders are generated on paper and sent from the supplier to the customer. As the commission of the ISAs depends on the amount on the transactions, they have a legal right for comprehensive reporting on all bookings leading to commissions. The supplier is obligated to supply this information on a timely basis to the ISA. In some negative examples the supplier sends all applicable invoices to the ISA every three months with a request to calculate the commission.

**Explorative-Finding III:** Address data of the customer is held by the ISA. In the case of an address change or a change of the contact person, the altered data must be transmitted to the supplier.

**Explorative-Finding IV:** ISAs are bound to visit their customer on a regular basis. As a proof of their activities they must provide visit reports.

**Explorative-Finding V:** In the preparation of a visit a sales agent has to know about the status of open orders or invoices. He must be able to explain delayed deliveries or to take consequences of delayed payments. Due to integration problems, the status information is usually not available at a timely basis.

**Explorative-Finding VI:** In the product presentation IS support might be helpful, e.g. to display a video demonstrating the mode of operation of a technical device is considered helpful. Yet sales agents value the personal contact with their customers very high. IS support in general is considered harmful to that relationship and therefore not desired during contact with the customer (see also Leek et al. 2003).

Quantitative Verification

For a verification of the qualitative results presented above a questionnaire was sent to 1,800 ISAs in Baden-Württemberg, Germany. In total 53 questionnaires were returned which calculates to a return rate of 3.2 %. As a restriction it has to be noted that the survey is not representative and therefore a generalization of the results is only possible within the target group. Nevertheless, the results could be of use, because of the novelty of the information presented.

First of all the results help to clarify the scope of ISAs. It was found that they have an average of 4.1 employees not counting the owners of the agency. Additionally 96% have no more than 5 field workers; here the average is at 1.7. This underlines that most independent commercial agencies clearly qualify as micro-sized enterprises. In spite of that, 93% operate for more than one supplier. In fact, 83% have relationships to 2 to 10 suppliers with an average of 6.7 suppliers and a standard deviation of 9.2 (Figure 2). The association of ISAs in the area where the survey was conducted reports a mean of 4.9 suppliers per agency. This emphasizes the significance of a system that supports multi-vendor sales processes yet being affordable to small size enterprises. From Merrit and Newell (2001) we know that about one supplier is added and one dropped per year.

A clear regional focus can be observed, 60% of the participants concentrate on business in the region. Only 20% focus on the national and the remaining 20% the international market. As a consequence an internationalization and localization support is not included in the requirements. The majority of 60% has 11 to 500 customers and only 30% have more than 500 customers. The biggest group of participants (50%) are commercial agencies which trade technical products. Another 25% address consumer goods and textiles. The remaining 25% are distributed evenly among 5 different product types. The smallest ones are consequently 10 times smaller than the biggest one. The requirements could concentrate themselves on
Kokemüller et al. Mobile support for collaborative multi-vendor sales processes

technical, consumer and textile goods on the other hand while staying on a coarse grained view on products, the differences are not severe enough to exclude some segments specifically.

Most ISAs make use of some sort of IT-system. Most use email and an office package but only 56% use IS support in contact management, 31% in financial accounting and 15% make use of an ERP system. Only one agency uses a web shop and none a system for product information management (PIM). 47% of the participants responded that they have very poor to poor IT knowledge, even though most of them administrate their IT themselves.

Histograph

Figure 2: Frequency distribution of the number of suppliers

A valuable distinguishing feature is provided by the product categories an ISA trades. Here three categories are used: standard products, configurable products and individual products (Dolmetsch 2000). In the questionnaire the ISAs were asked to provide an estimate of how their products spread over these three categories. Running an analysis of the ISAs and clustering them into groups respective to their traded product categories leads to the results presented in Error! Reference source not found., which show the ratio of the product categories within the clusters, as well as the total number of agencies situated in that specific cluster.

Table 1: Division of ISAs into 4 different clusters

<table>
<thead>
<tr>
<th></th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>0.86</td>
<td>0.08</td>
<td>0.02</td>
<td>0.38</td>
</tr>
<tr>
<td>Configurable</td>
<td>0.08</td>
<td>0.82</td>
<td>0.01</td>
<td>0.29</td>
</tr>
<tr>
<td>Individual</td>
<td>0.06</td>
<td>0.10</td>
<td>0.97</td>
<td>0.33</td>
</tr>
<tr>
<td>Number of agencies in category</td>
<td>22</td>
<td>5</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>Fraction of agencies in category</td>
<td>0.42</td>
<td>0.09</td>
<td>0.23</td>
<td>0.26</td>
</tr>
</tbody>
</table>

The biggest group made of 42% of the participants deals primarily with standard products (Cluster 1). Another 26% have a mixed assortment that spreads evenly over the three categories (Cluster 4). The clearest focus is visible in Cluster 3 where 97% of the products are individual products. The last cluster (2) has its focus on configurable products; with only 9% of the
Mobile support for collaborative multi-vendor sales processes

Kokemüller et al.

Verification of Sales Processes

Starting from the processes indentified in the workshop and focus interviews the explorative results were verified with the participants of the survey. For that reason, the explorative processes were included in the questionnaire and rated for their effort and feasibility by the participating ISAs.

Survey-Result I: The support in the economic paperwork (Explorative-Finding I) has a mid-range priority for the ISAs. The possibilities of mobile support are rated as medium.

Survey-Result II: Reconciliation of commission payments (Explorative-Finding II) is of high importance, the possibilities of mobile support are rated as medium.

Survey-Result III: Contact management (Explorative-Finding III) is of high importance and the mobile support is also rated as being important.

Survey-Result IV: The provisioning of customer visit reports (Explorative-Finding IV) from the ISA to the supplier is done frequently and the effort is large. The necessity of mobile support is rated medium.

Survey-Result V: The effort in the preparation of a visit (Explorative-Finding V) is large and at the same time this job is done frequently. Especially information of the delivery status would bring a substantial benefit to a mobile sales agent, as he can check the status of the deliveries, together with the customer or right before the visit. More often reconciliation on the status of quotes, orders and invoices is done; then again the urge of mobile support is only rated medium.

Survey-Result VI: The feasibility of mobile support in the extended product presentation process depends to a large extent on the product categories an ISA trades. In the first step, the provisioning of information materials to a prospective customer, all ISAs utter a need for mobile support. If they trade individual or configurable products, their effort for getting the first contact is significantly higher. In comparison the efforts for ISAs that trade standard products is lower. Yet the feasibility of mobile support for standard products is constantly high. During product presentation the activities shift significantly. Now the ISAs of standard products have their largest effort. With standard products it is still high, while with non-standard products it is significantly reduced. The preliminary result Explorative-Finding VI provides a reasonable explanation for those who trade non-standard products, for those trading standard products it has to be revised. In detailed consultancy, the above is emphasized.

Especially the activities in the product presentation have to be discussed in more detail (see Figure 3). Interestingly there is the fact, that in the domain of sales processes, a distinction between ISAs trading configurable and individual products is not
necessary. A coarse grained distinction between ISAs trading standard and non-standard products seems to suffice. Figure 3 omits the values of Cluster 4, as it is close to the overall mean. The behavior of the agencies in Cluster 4 can therefore be viewed as a mixture of the remaining clusters.

REFERENCE DESIGN

Having analyzed the current situation of ISAs in the previous section, we now design an IS artifact to obtain knowledge and understanding about the achievability of IS support for ISAs (Hevner et al. 2004). In this section we formulate the requirements and describe how we adopt them in the IS artifact.

Requirement I: The system has to integrate multiple ISAs with their respective suppliers. At the same time, it has to integrate multiple suppliers with their respective ISAs.

In order to achieve this, backend integration to the legacy systems (if existent) of the ISAs and even more important of the suppliers is necessary. This integration bears several challenges. From the survey two conditions can be deduced that are particular to the discussed IS artifact. These are the diversity of systems utilized and the limited financial resources.

The approach chosen in the artifact is the utilization of open standards for the transfer of transactional data, contacts and catalogs. Coarse grained interfaces are proposed for their import and export. There are several standards for product catalog exchange that could be used. An XML-based one is BMEcat (2008, Schmitz et al. 2004). The same applies for transactional data where one possibility is given by openTRANS (2008). The interfaces of the artifact are published as Web-Services to the public. This allows the development of low-profile connectors to the systems that are applicable to a broader audience independent of the IS artifact, thus increasing reusability. A connector in this scenario transforms data in an open standard to or from a proprietary format or a low-integrated format like emails that suffice to some users.

Some aspects can be addressed with loosely coupled systems following the SOA approach, but at the same time new problems arise. In the cross-organizational domain it is of utmost importance, that information entities are linked and means to enforce data quality are implemented. We believe that this is best addressed by a centralized Master Data Management (MDM) as part of a SOA where changes are propagated following the intra-organizational relationships. A distinction to intra-organizational MDM is drawn by questions that arise in the areas of data ownership and data governance. We belief that those questions and their implications are of importance, nevertheless due to limited space they have to be discussed separately.

Requirement II: Mobile access has to be possible

Web-Services provide a generic interface to mobile clients. Their mobility raises issues concerning unstable connections and changing IP addresses. We address these by means of a local data store which has to replicate with the central database. Most certainly not all data can be replicated to a mobile device. This is because of their size and security implications. As a consequence only textual data like address information is replicated. Binary data, like large product sheets, is excluded. Earlier the requirement for a SOA was discussed, with this requirement the IS artifact has to provide a mobile SOA (mSOA).

The mobile access to the system is an interface to the backend limited to a specific functionality subset. In this context the mobile device is supposed to contain a small display with low resolution and possibly a keyboard with a reduced set of keys.

The functionality of the mobile access is described in the requirements below.

Requirement III: Web-based access has to be possible.

Complementary to mobile access a web-based interface has to provide access to all functionalities. We propose it web-based to get easier integration with diverse devices and accessibility in stationary as well as mobile environments. Here mobile devices are fully-fledged mobile PCs like notebooks with a (wireless) connection to the internet.
Requirement IV: A contact management has to be included where agencies and suppliers can foster their customer contacts.

Customer data has to be always accessible (Survey-Result III). This demands its availability in mobile devices, maybe even to program a GPS device for routing. Additionally this data has to be available in the back office via the web-based interface to allow the usual office tasks.

In the case of customers the Master Data Management has to ensure, that data harmonization and matching is only done in the context of one ISA. This is to prevent that one ISA possesses multiple logical instances of one physical customer entity. In the cross ISA domain multiple instances of a single customer must be possible. Otherwise questions arise of who possesses a certain customer and has the right to alter its data, in addition abuse and proliferation of strategic information to competitors is potentially possible.

In the artifact there is no direct relationship between the supplier and the customer. While the direct relationship certainly exists in the business world it is not the focus of the architecture and therefore excluded. Nevertheless an indirect relationship is created when an ISA creates a project or a business case. If a business transaction has taken place, that relationship gives the supplier access to the customer’s data. A project in this context is defined as a procedure that involves one customer, one ISA and one supplier but involves more that one business transaction, e.g. a procedure that spans multiple business activities on different dates.

![Domain model on the entity relationships of the IS artifact](image)

Figure 4: Domain model on the entity relationships of the IS artifact

Requirement V: Information material on standard and non-standard products has to be accessible.

Figure 4 depicts the entities Catalog, Category and Products as a coarse view on products. They possess several relationships worth discussion. Products can have recursive relations to model one product being part of another. Likewise they can refer to others as their spare parts. Next they are ordered into categories which themselves can build a hierarchy of categories. Categories are than used to build specific catalogs. A supplier builds different catalogs and grants access to these catalogs to specific ISAs.
The product information has to be accessible via the mobile interface in order to be able to compose requests for proposals, quotes, etc., and to create visit reports (Survey-Result V). We consider it reasonable that more detailed information like data sheets stored in binary formats are only accessible through the web interface, that is only using a notebook or likewise. These devices provide the means to present this information appropriately to both, the sales agent and the customer (Survey-Result VI).

**Requirement VI:** Creation of transactions has to be possible

Although there is no big demand on the creation of all transactions (Survey-Result I), it is necessary to provide valuable information. As long as the productiveness is enhanced, acceptance can be expected (Schillewaert et al. 2005). We propose two transactions that can be started through the mobile and the web interface:

- In the sales process requests for quotations or quotes are important documents created by the ISAs. These can include products; in the case of non-standard products we design the IS artifact to provide this functionality in a textual form. As we know from interviews, ISAs usually sell products from different suppliers at the same visit. Consequently the artifact is designed to allow the ISA to compose one document built out of several parts, each assigned to exactly one supplier. This provides the ISA a homogeneous view on one visit, while separating the concerns of the suppliers. The artifact promotes the documents disassembled to the designated supplier, thus creating a distinct view to them.

- From Survey-Result IV we know that there is a demand for IS support in the creation of visit reports. Therefore the artifact is designed to allow their creation. Similar to the above, the ISA can create one visit report and split it into segments. A variation is that those parts can be assigned to zero or more suppliers. This allows the creation of personal notes for the ISA as well as the provisioning of one segment to multiple suppliers simultaneously. Analog to the above, the visit reports are reassembled to distinct views for each supplier.

We expect the creation on a mobile device of those documents to be a potentially tedious task. Therefore a staged process is proposed, that allows their creation in a shortened form and tagging them as incomplete leading to a follow-up activity at the back office.

**Requirement VII:** Tracking of transactions has to be possible in near-time.

To be able to provide valuable information on transactions, integration between the suppliers and the ISAs has to be existent in the IS artifact. Transactions done in legacy systems are therefore required to be represented as documents in the artifact. (See also Requirement I). There they are generally grouped into business cases. The business case (see Figure 4) is the process starting at a request for proposal and leading eventually to an invoice, which themselves are held in the artifact as distinct transactional documents.

The transactional documents form a manifold that in this context cannot be discussed in full completeness. On one hand they can be legally important documents like requests for proposals, quotes, invoices or reports on calls made; on the other hand they can be merely notes on contacts or telephone calls. Some documents may involve products. Others can be related to a customer directly, this applies to notes on telephone calls that may have no direct connection to a business case.

Access to those transactional documents has to be possible at every time. From Survey-Result V we derive that this is one of the major aspects to improve the productivity of the ISAs and therefore a key aspect to leverage acceptance (Buehrer 2005). Accordingly we require that the mobile access provides all information usable on those devices. Additional information, like binary documents corresponding to the business case, is required to be accessible through the web access.

This information is additionally used to allow reconciliation of commission payments (Survey-Result II).

**CONCLUSION**

The current situation on mobile sales support systems for ISAs has been recognized as being insufficient. The integration with multiple suppliers yields to challenges that have to be addressed by a centralized platform. We were not able to indentify any current CRM system that offers this kind of integration. The daily work procedures of sales agents reveal the requirement for a mobile access to this platform. Central aspects that have to be addressed focus on information transmitted between the ISA and its suppliers. These include current data on business transactions and access to product catalogs provided by the suppliers. We proposed a centralized Master Data Management (MDM) to ensure a high level of data quality by the integration of cross-organizational data sources combined with data matching and harmonization.
We discovered that the needs in the sales process depend significantly on whether the product is a standard product or not. While in the latter IS support primarily focuses on information material, in the first case the whole sales process is subject to IS support. From the requirements we presented, an IS artifact has been implemented to verify the findings against the target user group. We also expect that security is an issue that has to be discussed in more detail to augment the acceptance of the IS artifact.

REFERENCES