E-ORDERING IN THE PHARMACEUTICAL SUPPLY CHAIN
Explaining Standardisation from a Collective Action Perspective

Stefan Schellhammer, Kai Riemer and Stefan Klein

European Research Center for Information Systems (ERCIS)
Department of Information Systems, The University of Münster
Leonardo-Campus 3, Münster, Germany

Abstract: In this paper, we discuss a unique case of industry-wide standardisation, i.e. the proliferation of an electronic ordering protocol across wholesalers and community pharmacies in the Republic of Ireland. The existence of multiple parties involved in the standardisation process and the nature of the standard lead us to study the case from a collective action perspective. In doing so, the emergence and the diffusion of industry-wide standards are being studied as distinct but connected set of dilemmas. The case leads us to theorise that strong industry associations play a significant role in the initiation and success of such standardisation efforts on the industry level. Due to space restrictions this short paper can only provide a snapshot of our entire argument; a long version can be obtained from the authors.

1 INTRODUCTION

The formation of interorganisational information systems (IOIS) has been widely studied in the IS literature. Typically, the purpose of an IOIS lies in supporting, facilitating, or improving inter-organisational (business) transactions, with electronic data interchange as the core building block. In this paper, we specifically focus on vertical information systems (VIS) that promote data exchange and business process coordination between business partners along the supply chain. In doing so, we concentrate on the development of core standards as a prerequisite for the development of interoperable systems among the business partners. The core standards encompass communication protocols, message syntax and semantics, such as product codes. Despite the large body of literature on standardisation and IOIS it still remains unclear why in some industries open standardised IOIS have emerged whereas in others competing systems developed.

IOIS are sometimes regarded as a strategic device to improve customer retention through lock-in, while in other cases IOIS may serve as a means to collectively reduce transaction costs. In this paper, we will concentrate on the second type and briefly juxtapose it with an example of the former type. Our case covers the standardisation process in the creation of a universal electronic ordering system in the Irish pharmaceutical distribution, which took place during the 1980s. In contrast to the standardised Irish solution, in the British pharmaceutical distribution industry several competing electronic ordering system have emerged.

Our data shows that the resulting differences cannot be explained by environmental factors like regulation or by the needs of their users; most of these factors are strikingly similar. The question arises what triggered the set up of the Irish system in this unique way. We will argue that an industry association has played a significant role in this process, and that the role and importance of associations for the emergence of IOIS has not been studied sufficiently (Damsgaard & Lyytinen, 2001).

We are facing two challenges: (1) How can we explain that the initiators or sponsors of electronic ordering solutions (in our case the wholesalers) partially suspended their competition and agreed on standards to be used for electronic ordering? (2) How can we explain the adoption and diffusion across a heterogeneous and fragmented group of business partners, i.e. the pharmacies. We will approach this effort from a collective action theory perspective. In our analysis we draw on earlier work conducted in this field (Markus *et al.*, 2006).

In the next section we present the Irish case. After this we introduce collective action theory before we analyse and discuss the case.

2 IRISH PHARMACEUTICAL DISTRIBUTION INDUSTRY

In this section we document how EDI standards emerged in the Irish pharmaceutical distribution between wholesalers and community pharmacies. We begin by introducing our method and give a brief overview of the pharmaceutical industry in Ireland. This is followed by a description of the emergence of the standard itself and its subsequent use by the actors.

2.1 Method

A case study design has been chosen to conduct the research, because of the complexity of the research question and its focus on a rich real-life context (Yin, 2003). Four semi-structured interviews have been conducted, two with a representative of one of the Irish pharmaceutical wholesalers, one with leading managers at the Irish body of community pharmacists (IPU) and one with a manager of a large software system vendor. All interviews were tape recorded, transcribed, coded and analysed. The data was evaluated independently by two researchers. Furthermore, several other data sources were used for the study – among these are web sites, standards documents, systems documentations etc.

2.2 Market Structure

The task of the pharmaceutical *wholesalers* is to provide a national wholesale service for pharmaceuticals for community pharmacies and hospitals. The relevant market is demarcated by the national borders. As a result of a consolidation process over the past 10-15 years, the market in the Republic of Ireland (R.I.) is nearly evenly divided between three wholesalers. All Irish wholesalers operate as nationwide full-line suppliers.

On the customer side more than 1400 *community pharmacies* exist in Ireland. Irish pharmacists are represented by a professional body, the *Irish Pharmaceutical Union (IPU),* which represents 90% of all Irish pharmacists. The mission of the IPU is to promote the professional and economic interest of its members. This incorporates conducting negotiations on behalf of the members and the development and maintenance of a "constructive dialogue with government, agencies and other groups in relation to matters of mutual interest." (IPU, 2006)

Three *software vendors* serve the pharmacy market. Their product, the "patient medication record" (PMR) incorporates the EDI standards as basis for the ordering module. Around 1300 pharmacies work with computer systems (typically with electronic point of sales systems (EPOS) and dispensary software).

The *wholesale prices for drugs* are fixed as is the margin for wholesalers. However, the wholesalers de facto pass on a significant part of their margin to the pharmacies via rebates, bonus schemes and other price incentives (Fingleton *et al.*, 2002). These prescription drugs are paid by the patients or they are reimbursed to the pharmacies through a variety of state-administered schemes (GMS, DPS, LTI).

As a result of these regulations the use of *pricing policies* by wholesalers and pharmacies is very restricted. As wholesalers typically offer volume discounts, pharmacies generally use one wholesaler as the primary supplier and a second one to split purchases and as a fall-back when supply of a particular product cannot be obtained (Fingleton et al., 2002). While the wholesalers compete for becoming a pharmacy's preferred supplier, the pharmacies use their bargaining power as a result of low switching costs: The *possibility to switch between wholesalers* alleviates the problem of stock shortage on the wholesalers' side, because they risk loosing pharmacies in case of repeated stock shortages. *Swift delivery* is a crucial element of the pharmaceutical supply chain. Consequently, most pharmacies operate on very small stock. This is made possible by extensive logistics operations. Pharmacies can rely on very short delivery times and deliveries two times a day by each of the wholesalers. Wholesalers will ship on the same day all orders that are received by the cut-off time late in the morning.

2.3 Emergence of the Standard

In 1984 United Drug (UD), one of the wholesalers, studied the emergence of electronic ordering systems (McKesson, see (Johnston & Vitale, 1988)) and intended to adapt one of the U.S. solutions for the Irish market. The Irish pharmacies, in dispensing medicines, only kept handwritten records at the time.

Because pharmacy market regulation varies significantly across countries, UD decided to develop a new solution from scratch. In doing so, UD played with the idea of developing a proprietary ordering system; the strategic rationale being to lock-in

pharmacies and subsequently to increase market share. The idea was to take the UK market as a blueprint where American Hospital Supply had successfully established ordering software to lock-in hospitals.

While the wholesalers claim that they ultimately realised the shortcomings of a proprietary solution it was the Irish Pharmaceutical Union (IPU) who strongly engaged in the process and came out with an open solution. While the IPU regarded the move from placing orders over the phone to submitting electronic order files as a clear administrative advantage for the pharmacies (faster, less errors etc.), key actors at the IPU emphasised the benefits of a standardised solution over a number of proprietary solutions for the pharmacies.

As a result, the IPU facilitated negotiations among the wholesalers to develop both a standardised order data transfer protocol and a common numbering system (based on EAN). While wholesalers in the UK were introducing product numbering based on the PIP code, IPU had been negotiating with EAN (at that stage it was EAN UK, today it is GS1 Ireland) to use its numbering scheme. The idea was to administer a central product identification number that does not differ between wholesalers, as was (and is) the case in the UK (Chemist&Druggist, 2007). In order to facilitate the introduction of EAN numbering codes, the IPU itself applied for and was granted manufacturer status in order to be able to assign EAN numbers to pharmaceuticals.

In parallel, the IPU facilitated negotiations among the wholesalers and system vendors. Consensus on a common protocol was achieved after about 6 months. At the time, half a dozen system vendors developed pharmacy solutions and all of them included the electronic ordering standards into their packages. Conceptually, this led to the proliferation of different IOIS, all of which are using the same standardised EDI components (see Figure 1).

2.4 System Usage and Maintenance

The diffusion of electronic ordering happened gradually over a 10 year period; today, all pharmacies are able to order electronically and the transactions between wholesalers and pharmacies are still based on the same system. Surprisingly, even the modem-based communication protocol has survived virtually unchanged. Electronic ordering (eOrdering) accounts for 90 percent of all orders.

The wholesalers' systems accept incoming orders (wants lists) via a modem connection and send back an order confirmation. If all items on the

"wants list" can be supplied no response is sent. In any other case the systems send back a list with unavailable items. Furthermore, bonus items are reported back to the pharmacist in this way. The pharmacy can then immediately turn the list of out of stock items into an order with one of the other wholesalers.

The IPU-product file is a complete list of all products available in an Irish pharmacy. It identifies each item by an IPU-number. Furthermore, the file also contains characteristics of the product (package size, ingredients and toxic class), consultation advices, prices and additional codes for reimbursement. For maintenance and administration of the file, the IPU operates a dedicated department. The IPU distributes the product file on a monthly basis to all pharmacies, wholesalers and system vendors.

The order protocol uses the IPU product file for product identification and the IPU communication protocol called IPUCOMMS v 2.4a for the modem dial-up link from the pharmacy to the wholesalers.
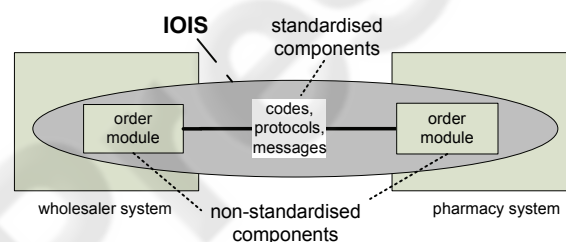

Figure 1: Components of the IOIS.

3 COLLECTIVE ACTION

The case presented above shows the development of common EDI standards, which are the cornerstone of the electronic ordering system that is still used in Ireland today. We argue that the presented phenomenon of joint standard development can be interpreted as a case of collective action.

The Theory of Collective Action deals with the provision of public goods. It explores the market failures where individual rationality and self-interest do not lead to an efficient provision of public or collective goods. Please note that, in our case, we are looking at standards as an instance of non-pure public goods, i.e. club goods that belong to a sub group of the market (they are excludable (Kindleberger, 1983)), but share similar characteristics.

Markus et al. have studied the consequences that collective good characteristics have on standardisation. (Markus et al., 2006) They differentiate the

development and the diffusion of standards as two distinct dilemmas. They come to the conclusion that for a successful standardisation both need to be solved at the same time.

The *dilemma of the development of a standard* refers to the different areas of conflict that exist when a standard is developed in a consortium: Conflicts of interest refer to the heterogeneity of interests among the actors; conflicts of alignment refer to the cost of aligning internal systems to the new standard; and conflicts of appropriation result from different cost/ benefit structures of the actors (Müller-Tengelmann, 1995). Mechanisms have to be found to solve these conflicts to ensure successful standards development.

The *dilemma of the diffusion of standards* refers to the incentive to delay the adoption of a standard until a critical mass has been reached. The diffusion of public goods (e.g. communication standards) is often hampered by what is called the penguin effect (Farrell & Saloner, 1987): Early adopters cannot capitalise fully on the standard as long as no other actor adopts the standard (negative network effect).

The interconnection between both dilemmas has been described by Markus et al.: "…standards content can be seen both as an outcome of the mechanisms employed by a VIS standards-setting consortium to resolve collective action dilemmas and as an input to diffusion on the VIS standards developed."(Markus et al., 2006)

The successful development of a standard is the conditio sine qua non for its diffusion. However, it does not guarantee the success of the standard in the market. To the contrary, strategies to solve the development dilemma can turn out to be counterproductive for its diffusion. Hence, the dual dilemma situation can only be solved if both dilemmas are targeted simultaneously.

4 CASE ANALYSIS

In this section we analyse the driving factors behind the standardisation process in the Irish case using collective action as the conceptual framework.

4.1 Standards Development

While different actors claim ownership of the idea of a standardised product code, the IPU certainly has been one of the most vocal advocates of standardised solutions at a time when some of the wholesalers were still considering proprietary solutions. Their rationale was threefold: a single standard in the Irish

market would facilitate the existing practice of order splitting and thus maintain the lever by which the pharmacies executed their (small) power vis-à-vis the much bigger wholesalers. Secondly, standards-based electronic ordering would be the most efficient way of ordering and would help to reduce transaction costs. Thirdly, the Irish market is too small to justify competing solutions.

Moreover, the IPU clearly played a crucial role in facilitating and moderating the negotiations between the wholesalers. The IPU provided a neutral venue and drove the negotiations without being perceived as partisan. In effect they facilitated joint action of the wholesalers. The negotiations took about six months which were regarded as efficient by the participants.

In doing so, the IPU played a triple role: Next to the *moderator or broker role*, the IPU represented the pharmacists and their interests. Given that they represented the overwhelming majority of pharmacists, they had a strong mandate to articulate their constituents' interests. Through this *representative participation*, they not only pushed hard for a standardised solution but also shaped the design of the standards. Moreover, the IPU provided some initial assurance that the solution would be adopted by the pharmacies, the prospective adoptors: the IPU de facto overcame the fragmentation of the pharmacies and ensured that the new system would perpetuate and indeed facilitate the established practices of order splitting. Thirdly, the IPU became the *secretary of the standardisation process*; in particular they agreed to take the role of developing and maintaining the product codes (IPU product file). Thereby they ensured the sustainability of the chosen solution and reinforced their role in the market by securing an additional revenue stream based on the license fees for the product file.

All in all the IPU managed to contain the conflicts of interest among the wholesalers (horizontal conflicts of interest) as well as potential conflicts of interest between the wholesalers and the pharmacies (vertical conflicts of interest).

The alignments required of the internal systems, as another potential area of conflict, could be kept to a minimum by developing a product code that conforms to the EAN-13 standard that was already being processed by the wholesalers. Thus, no major alignments were required. With respect to the ordering protocol, the negotiating process has been described as very cooperative in the sense that different needs of the participants were accommodated. Under the prime aim to hammer out a common protocol, the wholesalers tried to make sure that it

would dove-tail with their systems. Furthermore, the scope of the solution was kept lean so that alignments were kept to a minimum.

Conflicts of appropriation are the third area of potential conflict. Our data reveals no indication of this type of conflict. Ordering protocol and product file are administered and maintained by the IPU. The IPU refinances these activities through licensing fees from wholesalers and manufactures. Our data does not indicate that this division of tasks has ever been challenged by the actors.

The case shows a successful development of a standard. This is especially interesting as in other countries with similar characteristics like the UK (but also Australia) proprietary solutions exist. Good reasons can be found for either option: competitive advantages and customer lock-in on the one side, efficiency and swift diffusion on the other.

However, in the Irish case it was the IPU who facilitated the development of a joint solution. As the wholesalers are the main beneficiaries from electronic ordering, the IPU was in a position to articulate requirements on behalf of the pharmacies while providing assurances of the adoption and diffusion of the solution. Today, the product numbering scheme can be seen as a new power basis for the IPU. The IPU succeeded to preserve that power basis against the PIP-code solution of the wholesalers. Thereby the IPU was able not only to satisfy needs of its members but also to bring itself in a better position for future negotiations. In the end, the wholesalers made themselves dependent on the IPU and its product code.

4.2 Standards Diffusion

While the literature reports cases where the parties involved in the standard development later blocked or delayed their diffusion, the Irish pharmaceutical wholesalers embraced and supported the new standards. All wholesalers have integrated the new ordering standards into their own systems. The same is true for the system vendors supplying the pharmacies with the software.

While the IPU encouraged its members to install and use the new electronic ordering facility, it is reported that in the beginning pharmacists have been reluctant to use the new technology; they saw the advantages of the new system on the wholesalers' side. The wholesalers initially responded with discounts on electronic orders. Today, about ninety percent of all orders reach wholesalers electronically.

The high implementation ratio of wholesalers can be explained by the low costs of alignment and a lack of feasible alternatives due to the bargaining power of the pharmacists represented by the IPU. No wholesaler tried to impede the development process openly. And any attempt to promote a proprietary system by an individual wholesaler afterwards would not have been tolerated by the pharmacies, but would likely have encouraged them to switch to the other wholesalers. Furthermore, all system vendors took part in the negotiations. A multiplicity of proprietary standards would not have been in their interest, because pharmacists would have pressured them to build software incorporating all different standards.

Several factors can be identified that favoured the industry-wide standard and ultimately triggered its success: First, the IPU has a strong standing towards the wholesalers. The wholesalers were very aware that anything that would run against the interest of the pharmacists would face strong and painful opposition by the IPU. Furthermore, the IPU was not taken by surprise when the wholesalers started to develop electronic ordering solutions. Rather, the IPU was aware and attentive towards these new technologies and their implications for its members. This set the IPU in a position to intervene at an early stage, where the different stakeholders had not yet firmly committed themselves nor invested into a particular technology. Timing was critical and the IPU clearly used it to its advantage.

Another factor that facilitated the industry-wide standardisation can be seen in the relatively small group of wholesalers operating in a small and confined market. Regulated prices and margins pose a high pressure on wholesalers to optimise their processes and save costs in warehousing, delivery and order processing. Therefore a high incentive existed to get such a system working and thereby streamlining the order process.

5 CONCLUSIONS

While we are interested in the ordering system as a VIS or IOIS, our analysis has focused on the underlying standards as core prerequisites of interorganisational solutions. The Irish case reinforces the notion that standardisation processes for VIS are indeed precarious. Proprietary solutions have been considered by the initiators and have been chosen in other countries with plausible strategic motives.

Our data supports the notion of a dual dilemma of standardisation, which needs to be addressed si-

multaneously. The dilemma implicitly also addresses the need to overcome horizontal competition (among wholesalers) and vertical conflicts of interest (among wholesalers and pharmacies).

With respect to our research questions we have found theoretical explanations for the unique case situation. The single most important part of our explanation rests on the role, power and reputation of the IPU. The IPU facilitated to initiate and moderate collective action initially among the wholesalers and subsequently with an increasing mandate and role for themselves as party to the negotiations. By representing the overwhelming majority of the pharmacists they overcame the fragmentation of the market and changed the power dynamics in the negotiations. Moreover, they provided assurances with respect to the adoption of the standards. The IPU established themselves successfully as standards keeper. The availability of widely accepted standards like EAN product coding schemes clearly helped to build credibility and to enhance the acceptance of the chosen solution.

The wholesalers as initiators of ordering systems agreed on common standards because they saw (or were alerted to) the obvious interests of the pharmacies as potential adopters.

However, the constellations of actors, historical and regulatory environment has been quite unique. While we have found theoretical explanations for the outcome ex post, similar developments are still far from predictable. The notion of causality remains contested: too many contingencies and considerations are at play, which could have lead to another outcome. Hence we have tried to establish plausible reasons.

The specific actor constellation, in particular the multiple roles which the IPU played successfully, explain the achieved consensus. However, there were a number of facilitating contingencies, which have not determined the outcome but help to explain it: The historical coincidence of standard development in a technological "virgin market", where the business partners had not yet invested in their own systems, convinced all parties – including the software vendors – to pursue the chosen standards. The area of consensus building (product code, order message, communication protocol) facilitated the consensus building. The standards guaranteed interoperability between the applications yet in a model of loose coupling.

In the end, the strong role(s) of the IPU, in combination with the economic benefits (and incentives) of electronic ordering and the existence of one un-contested standard, lead to wide adoption and a sustainable solution.

ACKNOWLEDGEMENTS

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