

2009

# A Teaching Case Exploring The Development & Value Of A Retail Dashboard

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## Recommended Citation

Woodworth, Simon; Neville, Karen; and Frédéric, Adam, "A Teaching Case Exploring The Development & Value Of A Retail Dashboard" (2009). *MCIS 2009 Proceedings*. 13.

<http://aisel.aisnet.org/mcis2009/13>

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## **A TEACHING CASE EXPLORING THE DEVELOPMENT & VALUE OF A RETAIL DASHBOARD**

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### **Abstract**

This teaching case reports the development of a Dashboard designed to build a comprehensive picture (view) of an organization's customer-base. After more than 40 years of research focused on enhancing managerial support for decision-making through technology, the observation that, developing IT applications that are truly useful for top management is a highly complex and uncertain task, is still as valid as ever. The resulting Business Intelligence and Data Warehousing system supports the delegation and decentralization of decision-making and control in the organization as top managers have guarantees that their subordinates have access to reliable and timely information. This case demonstrates the utilization of IT (Data warehousing and On-Line Analysis Processing) to aid organizational decision-making through trend analysis, resulting in competitive advantage. Therefore, as a result, closer relationships with customers are developed. Additionally, this case can and is actively used to support teaching in undergraduate and postgraduate programmes undertaking Data Warehouse and Business Intelligence development, IT infrastructure and Networking (for connectivity).

**Keywords:** *BI, Business Intelligence, Dashboard, EIS, OLAP, Decision-making, Data Warehouse and Information Management*

### **1 INTRODUCTION**

Information Systems for executives raise specific problems, which are primarily concerned with the nature of managerial work itself (Mintzberg, 1973), as they are intended to tackle the needs of users whose most important role is "to create a vision of the future of the company and to lead the company towards it" (King, 1985; xi). The difficulty in supporting managers with computer systems comes from the very nature of management work (Mintzberg, 1973, 1975, 1976), which is consumed, for more than 80 percent of the time, with communication, coordination and people management. At the time of his research, Mintzberg (1973) noted how little time is left for reflection and for "playing" with computer systems. This has been a significant difficulty from the origins of MIS systems because their primarily "operational" focus was not realized to executives' concerns (Ackoff, 1967; Keen and Morton, 1978; Adam and Pomerol, 2008). More than thirty years later, this difficulty has also been largely responsible for the shift from Decision Support Systems (DSS) to Executive Information Systems (EIS) and from EIS on to Dashboards (Adam and Pomerol, 2008; Dover, 2004). EIS, defined by Watson et al (1991) as, "computerized system[s] that provide executives with easy access to internal and external information that is relevant to their critical success factors," and their Dashboard successors, are specifically designed to address the decision – making needs of executives. Dashboards and EIS are "quite close to the original DSS concept, yet they extend it to incorporate a broader set of users and a wider variety of decision making." (Clark et al, 2007). However, Dashboards, like the earlier Executive Information Systems have frequently fallen short of expectations and their implementation is a high-risk exercise (Poon and Wagner, 2001; Adam and Pomerol, 2008).

Considering the above changes, this case focuses on how Dashboards can actively support managerial work and in particular aid decision-making, with the objective of creating competitive advantage for an organization. This case is based on an ongoing analysis conducted by the authors of the Smiths Group which is one of the leaders in the Irish retail/wholesale market. It is a versatile organization with a long history of strategically aligning IT with its corporate goals.

The remainder of this teaching case is structured as follows. The next section describes and analyses the retail / wholesale company's phased approach in the development of a Dashboard to build a comprehensive picture (view) of its customer-base. The case was developed using informal interviews with the organization's IS, Sales and Marketing functions, corporate documentation and observation. Section 2.2 provides a detailed description of the decision-making structure within Smiths focusing on the IS function. Section 2.3 presents a rich description of the Dashboard which is supporting decision-making to create competitive advantage. Section 2.3.1 describes the approach used and the development of the Dashboard. Finally section 3 discusses the strategy used and the value of IT in the case, while section 4 presents the teaching note.

## **2 SMITHS GROUP**

The Smiths Group was founded in 1876. Originally a grocery business operating from two stores, the company is a family business (of which 70 percent is family-owned). The business expanded to include a Cash & Carry division (hereafter referred to as CC) in the early 60's when the emergence of multiples with their wide range of goods and very low profit margin threatened the existence of Ireland's independent trade. The aim of the company was to *"sell a wide range of goods at lower margins than traditional wholesalers"* and to *"provide the independent trade with the means to purchase small quantities of goods at low prices"* (company documentation). The first cash and carry was established in 1961 and was followed by similar facilities in almost all of the cities in the country. After this initial phase of development, efforts were aimed at enlarging the existing facilities in order to serve the needs of more than 20,000 independent shops, restaurants, public houses and other types of caterers. Nowadays, Smiths represents a purchasing power of more than €500 million per year, which is the key to being able to propose low cost goods to its customers.

### **2.1 Retail Outlets**

Smiths Group is also involved in another major activity in that it owns two franchised lines of supermarkets. *Retail 1* is made up of larger independently owned supermarkets. There are currently 211 Retail 1 supermarkets throughout Ireland, including 33 outlets in Northern Ireland. *Retail 2* is Ireland's leading convenience retail group, with bright, accessible community-based stores in over 320 locations throughout the country. Retail 2 stores provide customers with convenient shopping solutions. These stores also have a reputation for quality, value and friendly service, and the fact that stores are independently owned and operated by local people means that shoppers get the best of both worlds - commitment to the traditional values of good fresh foods and excellent services, combined with the price power and state-of-the art retail systems of a big national food store group. The business unit in charge of these two franchised lines is hereafter referred to as *Retail 1 & Retail 2*.

Smiths currently provides goods to approximately 440 franchised shops or supermarkets, which represent 20 percent of the €4 billion retail market in Ireland. In 1994 Smiths Group acquired a majority holding in *Retail 3*, a Spanish cash and carry company. Retail 3 has 17 cash and carry outlets in addition to owning 19 retail stores. Today, Smiths employs 2000 people in Ireland, Northern Ireland and Spain and achieved a turnover of €1 billion last year. Also, the innovation-oriented stance that Smiths has adopted in the Irish retail industry has meant that it is regarded as a pioneer in the use of IT in the retail business. The case is particularly notable for its early introduction of hand-held terminals in shops, for its successful application of Electronic Data Interchange (EDI) and for the implementation of the PC-based back office Electronic Point Of Sale (EPOS) store management system.

### **2.2 The Decision-Making Structure**

The decision-making structure in Smiths has changed dramatically over time, as prior research into this case has shown. It appears that a greater complexity of relationships between the different entities operating within Smiths and an intense competition for internal resources (particularly in relation to

capital expenditure) has emerged. Interviewees in the finance department of Smiths (called Group Finance as opposed to the finance departments of the decentralized units) agreed that this added complexity has become particularly obvious since the acquisition of Retail 3, the Spanish operation in 1994. As described by the company accountant,

The 1990s was a tough period for Smiths and for the retail business in general. There was a price war on the Irish market and the currency crisis made the situation very difficult. The entire strategy of the company at that stage would have been to maintain the market share and to retrench on our positions. The situation has clearly changed a lot. The Board is now looking to expand all the time and actively seeks opportunities to acquire other operations.

In this new context, the relationships between the decentralized entities that make up Smiths and the Group (the headquarters) have become more complex and a certain competition for development priorities has resulted as every aspect of the business is growing at a fast pace. Smiths is thus an exemplar of the shifts in the existing balance of power and the changing relationships between divisions and their headquarters in large multi-activity organization.

### *2.2.1 The IS Department*

Interviewees in the IS function remarked that Smiths could sell their expertise in dealing with very large volumes of transactions and even run the delivery and invoicing systems of other organizations on their behalf. This type of arrangement is already in place as Smiths collects cash and delivers goods on behalf of many large Irish food-processing companies. Given that Smiths is one of the largest processors of data in Ireland (behind the large banks), it seemed that selling that image could be profitable. Thus another business unit might be created within Smiths that would become an independent profit center while primarily serving the needs of Smiths.

In Retail 1 & Retail 2, the IS manager identified the usefulness of the expertise his functional area possessed, but was of the opinion that his unit should remain within Retail 1 & Retail 2. It was nevertheless the case that discussions were on-going at Board level in relation to the possibility to get even more “value for money” from the large investments in IS by selling a commercial service to other organizations in Ireland. On this issue, IT and Finance staff disagreed because the former were concerned about delivering a better service to their internal users and the latter were trying to maximize the contribution of IS in an accounting sense. Thus, each functional area perceived the contribution of other areas in its own terms, in cash terms for finance staff and in terms of satisfaction of information needs.

The future of the IS Department at Smiths, however ill-defined in relation to the above debate, was certain in many other ways: IT is fundamental for Smiths from an operational (internal communication, communication with customers and suppliers, monitoring and recording of transactions) as well as from a strategic point of view (realized distribution, management information, and value added services to customers). The area developed very significantly (more than doubling its number of staff) since the IS Department was split between Group, CC and Retail 1 & Retail 2. It seems to have particularly developed within Retail 1 & Retail 2 which established a rather independent if not dominant position within the IS network at Smiths. It is therefore likely that further developments will occur in this business unit such as servicing/supporting other organizations.

The IS function within Smiths came to play a vital role, which was in line with the importance IS has gained in the sector as a whole. As outlined by the IS staff interviewed, the success of the IS Department at Smiths arose largely out of the ability of developers to listen to their users. The department is perceived as being successful because the systems they developed had great decision making relevance. For instance, the new monitoring system for the warehouse enabled managers to, once and for all, answer the difficult questions about the slower lines of products that keep inventory costs higher than normal. In the words of the IS manager:

User involvement always makes projects longer, but it is needed because, at the end of the day, IS must provide a service or else we will come under huge criticism.

Thus, as he saw it, the ability of the IS Department to involve users and to take the time to interact with them was the recipe for success. This was evident in the contribution that IS has made in the strategic decision to switch to a Business Intelligence and Data Warehousing solution which would provide a Dashboard to executives and other users.

### **2.3 Business Intelligence, Data Warehousing and Dashboards**

It became evident in Smiths that managers needed to be provided with tools that helped them to identify signs in their environments (even the weakest ones) and to analyze key market trends rather than being flooded with sophisticated forecasts hinging on uncertain hypotheses. As a result, the emphasis in information systems design in Smiths shifted towards systems that provide managers with the information they require in a broader sense than just one specific decision to support their communication needs. Business Intelligence and Data Warehousing systems were put forward, by the IS Department, as the solution to the problems of information provision to senior managers.

Business Intelligence and Data Warehousing (hereafter referred to as BI / DW) systems are easy to use and help users manipulate required data without the need for much training. This was very attractive to top executives who wanted to have, at a glance, a complete and comprehensive view of their business. Naturally, computer literacy amongst executives increased to a great extent, notably thanks to the development and use of Email and the Internet. However, despite the designs that have been proposed over the years, managers are still not inclined to spend countless hours browsing computer data; such is the time pressure under which they operate. Beyond these pressures, there are issues of trust and of credibility of the information that can be found in a computer system, which diminish intensive executive reliance on information systems, especially in a long term perspective. The idea that decision makers need sophisticated models may actually be wrong. People controlling the preparation of decisions in Smiths were certainly able to understand and use smart models, but the high level executives who most commonly made the final decisions were far too busy to train with and use involved systems. On the contrary, they preferred simple systems that they trusted and understood and that displayed very timely, simple information.

A telephone survey of Business Intelligence users reveals the following benefits of Business Intelligence and Data Warehousing: Better quality information, more visibility of threats and opportunities, more information sharing, information is easier to obtain and analyse, decisions take less time to make with resultant improvements in efficiency and time and cost savings (Hannula and Pirttimaki, 2003). A later study by Elbashir *et al* (2008) reveals that BI systems yield internal process benefits such as improved process efficiency, increased productivity, reduction in the cost of effective decision making and lower operational costs. Smiths' Finance Trading Manager illustrates the ease at which data can be retrieved and analysed as follows:

One view will allow us to look at information at a fairly high level back from the retailers so that you can see for example how cereals are performing and it [BI / DW] can drill down into the product level in each store.

In addition, BI and DW systems have often provided non-performance related information such as travel information and even non-managerial company news, such as classified sections. A number of examples of successful BI and DW systems and their Executive Information Systems (EIS) predecessors have been presented in the literature and were studied by Smiths' IS Department. The AIMS system developed by British Airways was interesting because it was a very early example of EIS (1982). It was originally designed for the top managers of the company, but now has a very large number of regular users and is believed to have allowed British Airways to defend its market share better than its competitors throughout the 90s. It was noted that BI / DW systems could play a considerable role in focusing the attention of staff and other managers on the key areas that determined the performance of the firm.

Thus, if staff were aware that top managers' BI / DW systems tracked certain parameters, these parameters were likely to receive far more attention than those not being monitored. According to the IS manager:

The aim of the project was to enable IS to provide a much clearer pictures of where product lines are at and direct the attention of managers towards the problem areas.

The challenge, then, for Smiths, was to come up with a way of presenting vital strategic information in a simplified manner to top executives and as stated by the IS manager [to]...*deliver the organisational truth!* Could Smiths' IS Department rise to the challenge?

### 2.3.1 Dashboard Development

The IS Department in Smiths decided to tackle the problem by developing a *Dashboard*. Dashboards are regarded as a rejuvenated form of BI applications (Adam and Pomerol, 2008) and, when implemented properly, provide executives and other users with an overview of all relevant data, enabling them to align resources, prioritise actions and coordinate business activities across different departments (Dover, 2004). The concept of a Dashboard as it relates to the development of executive systems is based on an analogy with instrument panels in motorcars or control rooms in power plants (Adam and Pomerol, 2008). Motorcar dashboards in particular have been used by car-makers to give increasing levels of control to drivers over their vehicles. They are meant to provide drivers with real time data about the state of their vehicle and its progression along the road. Data falls in different categories depending upon their frequency of use and the degree of urgency of the signal they provide. In understanding the concept of dashboard, it is useful to consider for example the difference between the use of the speedometer (which is used frequently for a quick control) and the petrol gauge which is of more value at the start of the journey to plan for the use of available resources and may flash when it requires the drivers attention. However the power plant control room analogy is also important as this permits the operator to monitor and manage dynamic processes that are not directly visible to them. This element of the dashboard concept is particularly important to managers of business processes that span multiple functional areas and multiple sites (Adam and Pomerol, 2008) and as such is particularly germane to the Smiths case.

The IS Department was guided by a methodology called Critical Success Factors or CSF to guide Information Systems planning. Critical Success Factors assumes that the performance of organizations can be improved by focusing on "the few key areas where things must go right for the business to flourish" (Rockart, 1979). In simple terms, the method seeks to isolate, using the expertise and gut feeling of managers, the factors which may make the difference between success and failure for the firm. For instance, most organizations use profit margin as a key indicator of performance, and brand awareness (expressed as a percentage of the general public who know about a certain brand) may be considered by managers to be critical to success in the household product market. The control system must be tailored to the specific industry in which the company operates and to specific strategies that it has adopted; it must identify the critical success factors that should receive careful and continuous management attention if the company is to be successful and it must highlight performance with respect to these key variables in reports to all levels of management.

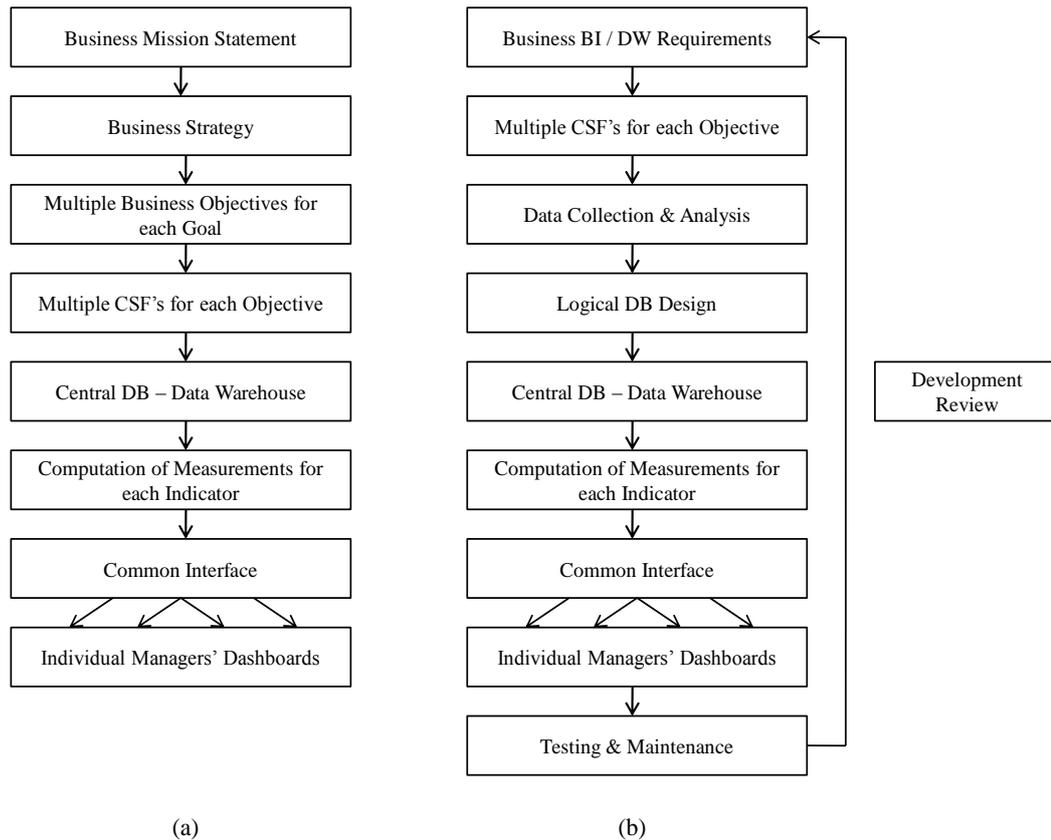


Figure 1: Top Down-Approach to Dashboard and associated Data Warehouse Development

One way that these concerns can be addressed is to begin the project at a high level and to use the strategic orientation given by top management to provide a backdrop for the identification of the indicators. This top-down technique is also suggested by Van Bullen and Rockart (1986) as illustrated in Figure 1(a) and reflects Gitlow (2005)'s view that dashboards are much more likely to be successful if they are structured from the very top of an organization. The IS Department adapted the technique as illustrated in Figure 1(b) to develop the Smiths Dashboard. Smiths identified CSFs for improved performance using a similar top down strategy. These opportunities (CSFs) were achieved through leveraging existing, unutilized customer buying information with the objective of generating competitive advantage.

Kumar and Palvia (2001) note that data are at the heart of any Business Intelligence and Data Warehousing system and these data need to be collected, processed, managed and then presented to executives to aid decision making. Prior to the introduction of the BI / DW system within Smiths, the IS Department in Smiths received a weekly file from each Retail 1 and Retail 2 store around Ireland detailing the performance of each product from individual stores for the previous week (i.e. the retail sales generated by that product). These product performance files, in text document format, were created by tills whose records for each product would accumulate in memory each day based on scanning sales. However, there was no indication of which day or time was the most profitable for the portfolio of products or how many customers shopped in the different stores. It was also impossible to analyze the overall performance of individual stores as well as a comprehensive single view of the business for management thus severely limiting the type of information available.

However in 2002, the company introduced a PC-based Cash Register System into all of its stores. This system not only provided the ability to create the usual weekly product performance file as in the previous system but it also provided the user with the ability to generate these reports on an hourly basis (an hourly file). With the availability of these data, management recognized that the information

required to improve performance could be exploited through the development of a Dashboard. From this, both the sales and management executives identified a number of critical success factors that would provide an enhanced view of their customer base and in turn provide the organization with competitive advantage in a tight marketplace (See Figure 2).

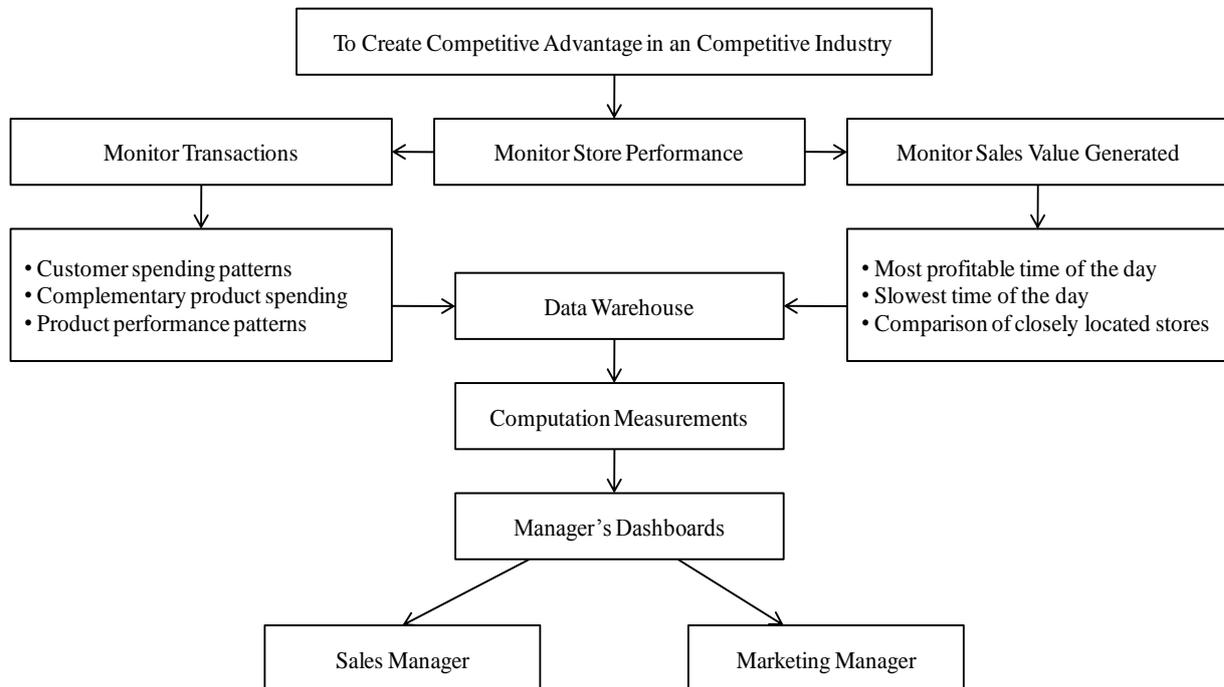


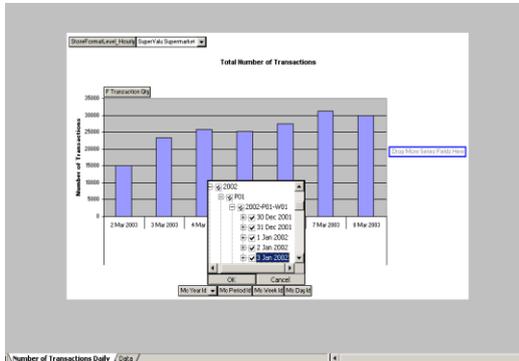
Figure 2: Smiths Dashboard and Data Warehouse Development

These hourly files were now received by the Smiths IS Department as part of the weekly batch file that was uploaded every Sunday night from the individual Retail 1 and Retail 2 Stores. When these batch files were automatically unzipped (one from each store) in the weekly run, the hourly files were sent to a folder on a remote drive (the Hourly Sales folder). It was previous to the introduction of the BI / DW system that these files were sitting, unused, in the remote drive. The purpose of the Data Warehousing system was to extract the hourly sales information from these files, validate, transform them using a Data Transformation Services (DTS) package and then load the data into the corporate Data Warehouse. Therefore the different departments, since the introduction of the BI / DW system in 2005 have been able to create dashboards of information via the company's On-line Analytical Processing (OLAP) reporting tools allowing easy but detailed analysis by the personnel interested in specific information. This reflects the tendency of OLAP usage to develop alongside Business Intelligence usage (Poon and Wagner, 2001). When this information was utilized in an appropriate manner, the information proved very beneficial in determining the key views regarding sales and marketing trends (See Figure 3 for samples).

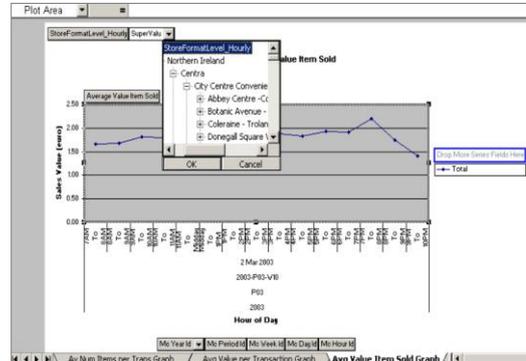
In the short term, this readily available and easy to use data meant that store resources could be refocused to account for crests and lulls in the trading day. From a long term perspective, through the availability of the information described, the company was able to align its spending on advertising with increases in daily store revenue and actually determine the effectiveness of a marketing campaign. This approach was also employed by competitors of the company, such as Dunne's Stores and Tesco Ireland to strengthen their relationships with customers. The introduction of Smith's (in-house) EIS proved a valuable stepping stone for the company in building a profile of each store and in analyzing the actions of their individual customers.

This case reveals the important changes in the organizational network that took place in Smiths over the last few years. These changes stemmed from an increase in both internal and external complexity of

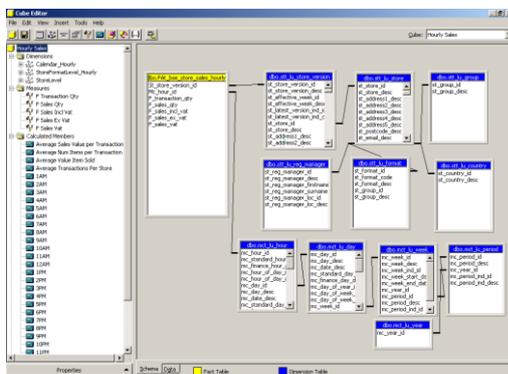
Smiths – i.e.: in the organization and in the business in which it is involved. As described by the interviewees, top managers at Smiths switched from a retrenchment strategy aimed at preserving its market share in the Irish market to a strategy of expansion aimed at diversifying its business interests in other markets through export and acquisitions. This resulted in acquisitions in Spain and the development of activities in Northern Ireland.



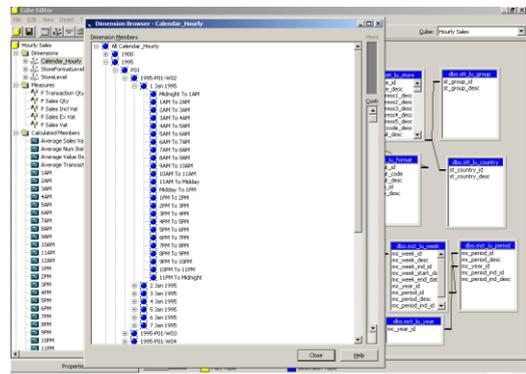
(a) Total Daily Transactions



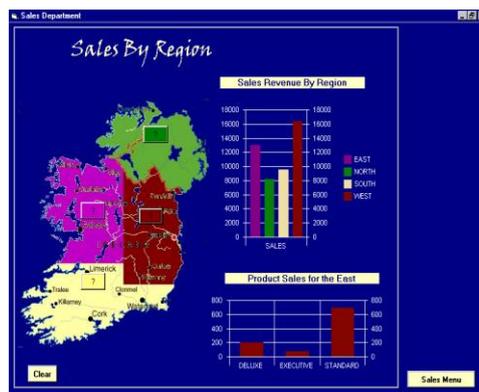
(b) Averages



(c) Cube Analysis



(d) Dimension Analysis



(e) Sales by Region

Figure 3: Dashboard and Business Intelligence Sample Screens

### 3 DISCUSSION

The consequences of these moves resulted in a marked increase in the complexity of the organizational network of Smiths as the range of decisions tackled by managers extended to new domains and the magnitude of the investment and expenditure involved rose dramatically. Many functions and expertise were decentralized into the divisions, such as the buying function, much of IT and Human Resources Management (HRM), while the financial control of the operations was centralized in a reinforced Group finance. Thus, the extent of delegation increased and local managers were able to commit larger resources without central approval, but procedures to access and obtain funds were tightened to enable the Board to monitor capital expenditure and growth and steer the organization in the strategic direction they saw fit. These changes resulted in the development of a dense network of informal flows between the divisions and the managers in Group Finance. IS was instrumental in providing the architecture that supported this increase in both internal and external (i.e. with shop owners) communication in Smiths. These flows were aimed at exploiting the expertise, knowledge and influence of these managers for the purpose of increasing the likelihood of successful proposals.

The development of the role of these managers put them at the hub of a network of documentation circulating about all projects, large and small, that occurred in Smiths. To serve these emergent needs, they developed a new database that enabled them to collect and store information about all proposals and to report on the overall resource needs of various kinds in Smiths. This type of information preparation provided a blueprint for the development of a Dashboard. Indeed, the reporting that emerged from this data was very helpful for both the Board (in an aggregate form) and the divisions (such as Marketing and Sales) who could utilize this organized archive of all their proposals in order to analyze their pattern of expenditure and produce better (i.e. more likely to succeed) proposals for future projects. The importance of these changes is profound as “...you cannot manage what you cannot measure” (Baskerville, 2008, p.2). According to the marketing manager there were still difficulties in applying metrics:

We try and measure the impact of promotions but it can still be difficult to isolate something like a promotion. It essentially depends on what your competitors are doing. Therefore we try and analyze groups of stores to determine which stores are in direct competition with a Dunnes or a Tesco offering discounts.

In the opinion of one of the managers interviewed, the decision-making culture at Smiths continues to change on an on-going basis, which is a requirement in the fast moving, dynamic environment in which the company operates. The aggressive entry of Tesco (which rapidly captured a 20 percent market share) in the Irish market indicates the danger inherent in believing that some kind of stability can be achieved in such an industry. Historically, this strategy paid off for Smiths as the benefits obtained from their previous implementations of new IT systems demonstrate. The EPOS system which uses regular downloads from Retail 1 & Retail 2's computers directly in the shops' PC-based management systems netted the company an extra 1 per cent in profit margin and largely paid for itself, in addition to providing essential services to shop managers in the areas of pricing, ordering and inventory control.

Thus, Smith's evolution over the 90s was heavily influenced by the implementation of an abundance of new systems, some operationally oriented, others aimed at speeding up and automating the circulation of information between key nodes in Smith's extended network and others again aimed at facilitating the decision-making of managers. This extensive contribution of IS to many aspects of Smith's business is reflected in the high status of IS (both as a functional area and as a domain of expertise) in organizational terms and the amount of attention IT matters get at all hierarchical levels.

### 4 TEACHING METHODOLOGY AND NOTE

The Smiths case is based on informal interviews with the organization's IS, Sales and Marketing functions, corporate documentation and observation. The overall learning objective of the Smiths case is

to teach students the skills required to effectively develop and exploit Executive Information Systems (EIS) and Data Warehouse technology in an enterprise context such as the retail teaching case outlined. It is also a rich teaching case for students through the investigation of the existing balance of power and the relationships between divisions and their headquarters in a large multi-activity organization.

The Smiths case was originally and is currently taught as part of the final years of an undergraduate and postgraduate IS programmes. It is now also being utilized as a joint learning exercise as part of the penultimate year of the undergraduate programme. The revised case is designed to leverage two different teaching modules covering Business Data Communications and IT Infrastructure (with a combined value of 15 ECT Credits).

The case enables students to:

- Study a full implementation of a Dashboard / Business Intelligence / Data Warehousing system and to effectively apply the knowledge gained as a result to other cases.
- Help students to understand the key stages in the development of a Dashboard, specifically the analysis stage of the development (previous and current implementations).
- Fully understand the network of actors (users) and their roles that must be taken into consideration, so that the requirements of a new system can be fully met.
- Additionally understand and see the translation of a company's strategy into reality through the use and development of an information system

The Smiths case can be used to allow students to explore the phased development of a Data Warehouse and the corresponding Dashboard to display both summarized and detailed analysis collected by the different information systems utilized by the case. Students can therefore study a case that has progressed from using a communication system such as Email and basic reporting files from store tills to support its 'actor network' in decision-making. The case provides a basis for students to follow the development of the company's in-house systems and eventual adoption of Data Warehousing to combine the different data sources within the organization. It also allows students to study how the theory of multi-dimensional views and On-line Analytical Processing (OLAP) can be applied in an industrial context. The context particularly emphasizes the adaptability of the technology in supporting any organization, as students can fully relate to the retail trade and apply the knowledge gained from the case to other problem areas that could benefit from a comprehensive view of a niche customer-base.

**Note:** A more detailed description of the case can be accessed at: <http://afis.ucc.ie/fadam/research.htm>

#### **4.1 Suggested Questions & Grading**

The following questions and group projects are examples of the possible uses of the Smiths teaching case. Each can be customised to the needs of individual educators.

##### *4.1.1 Final Year Exam Questions*

- **Describe** how the retail case described uses IT to support their internal processes.
- **Describe** in detail the role that the Business Intelligence and Data Warehousing system (or Dashboard) plays in the case.
- **Discuss** giving the case as an example how Dashboards may be used within organizations to support managerial activities. Indicate how Dashboards and BI systems in particular differ
- from Data Warehouses and On-line Analytical Processing (OLAP).

#### 4.1.2 *Group Development Project – (40% or 80/200 marks)*

Students are expected to develop a distributed system as an organizational management tool. Groups consisted of four students each represented a component of an organization (e.g. The Purchasing Department) combining to meet some common organizational goal, such as selling a product. Each student is expected to develop individual databases that were interconnected to form a Dashboard. The Dashboard is effectively an interface used to pull useful information from the individual databases for both the different departments and managers.

- Proposal – Written Document & System Specification

Groups are expected to identify and outline, in a document, an organization of their choice. The document should describe the Dashboards, BI and DW systems, and a plan of the development process.

- Analysis & Design (5%) – Written Document

The analysis stage of the project defines the problem or requirements to be addressed. Groups are also expected to outline the logical design of the BI and DW systems. Techniques such as Data Flow Diagrams (DFDs) and Entity Relationship Diagrams (ERDs) must also be outlined in the report.

- Prototype (15% - Individual Marks) – System & Written Specification

Individual students are expected to deliver a fully functional populated database and system specification including the data structures and security considerations.

- Dashboard (10%) & Written Document

The Dashboard is the final requirement of the project. The system should interface with the 4 departmental databases using for example a VB.Net front-end. Groups are expected to incorporate managerial requirements into the system such as Sales Forecasting. The Dashboard should also include different levels of protection (proactive and reactive) to effectively mitigate risks that the system could encounter.

#### 4.1.3 *Group Joint Project: Business Data Communications & IT Infrastructure (2 Modules)*

This assignment is split into two parts to provide students with the necessary skills for designing, implementing and protecting a network for a (retail) multinational. Additionally the infrastructure necessary to facilitate the full operation of the business is required. That is students are required to provide a full network and system infrastructure solution to the business problem as outlined in the case study. The full submission will reflect the networking and infrastructure skills learned and leveraged through the Business Data Communications (10 ECT Credits) & IT Infrastructure (5 ECT Credits) taught elements of (year 3 of) an undergraduate IS programme. In groups of 5 students are required to complete the following tasks based on the Smiths case described, illustrating their solutions when appropriate:

- Part A (Business Data Communication) – 30/200 marks:

Describe the most appropriate network configuration for Smiths based on the requirements of the different users. Discuss how the different retail outlets are connected to Smiths while additionally supporting the systems used for daily operations. Additionally describe the security controls necessary to protect the entire organisational infrastructure.

- Part B (IT Infrastructure) – 15/100 marks:

Describe the aspects of the Dashboard which have facilitated better decision-making in Smiths, and discuss how management at all levels use the Dashboard for decision-making. Identify what are the next steps in the enhancement of the current system which will ensure that Smiths retain a competitive advantage.

The joint project will be expanded next year to include all of the modules taught in the 3rd year of the undergraduate IS programme. Groups will be required to analyze the needs of the Smiths case and design the IT Infrastructure necessary to support the complicated structure of the organization.

Students will also be required to design a secure corporate network with business continuity capabilities and recommend appropriate operating systems (OS). The Dashboard, BI and DW elements of the case will also be met with the requirement of developing an Oracle Database with a Java front end and MS Excel reporting capabilities.

This planned and agreed project will enable educators to integrate all of the courses taught while simultaneously achieving individual module assessment goals. Therefore the case can be used and customised by educators with varied course objectives and learning outcomes.

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