

# EXECUTIVE BRIEFING

## The University of Cambridge Auto-ID Centre from 2001 – 2003 Going Global

Helen Duce

**AUTO-ID CENTRE** INSTITUTE FOR MANUFACTURING, UNIVERSITY OF CAMBRIDGE, MILL LANE, CAMBRIDGE, CB2 1RX, UNITED KINGDOM

### ABSTRACT

In order for the Auto-ID Centre to be successful it is essential that the system it develops is adopted globally. As a first step to achieving this the centre has expanded to Europe, opening an office at the Institute for Manufacturing at Cambridge University in the UK.

The University of Cambridge Auto-ID Centre will play two key roles. First to ensure that the Auto-ID Centre's system is adopted in Europe. This will involve raising awareness recruiting new European sponsors and ensuring current European sponsors' needs are being addressed by the centre. It will also involve working with consumer groups, trade bodies and governments to ensure smooth adoption. Secondly, in delivering world class research that will complement and build on the work at the MIT Auto-ID lab.

The final goal for 2001 – 2003 will be to hold a European Symposium in 2003 to launch the system within the European business community.

This Executive Briefing outlines in detail the University of Cambridge Auto-ID Centre's strategies and plans for fulfilling these objectives by 2003.

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### Biography

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by **Helen Duce**  
Associate Director Europe

Helen graduated from Lancaster University, England with a BSc in Marketing and Psychology. After a short stint as a broom sales person she joined Unilever in the UK as a part of their UCDMS (Unilever commercial development management training scheme) working for Matteson Walls and Van Den Bergh Foods as a brand manager. In 1996 she was transferred to Lipton in New Jersey, where she managed the North America beverage business innovation portfolio. In 2000 she joined a new division of Unilever called the Digital Futures Lab as the Digital Innovation Manager. Here she was responsible for driving the adoption of new digital technologies within Unilever. In 2001 Helen returned to her native UK to start her own, small consultancy called Prophetics.

Helen joined the Auto-ID Centre in September 2001. Based at the European centre at the University of Cambridge she is the associate director for Europe.

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## **1. OVERVIEW 2001 – 2003**

The Auto-ID Centre has a clear vision – to create a world where every object – from jumbo jets to sewing needles – is linked to the internet. Compelling as this vision is, it is only achievable if the centre's system is adopted by everyone everywhere. Success will be nothing less than global adoption. As first step to achieving this the centre has expanded to Europe, opening an office at the Institute for Manufacturing at Cambridge University in the UK.

The University of Cambridge Auto-ID Centre was officially opened at the beginning of 2001. The first year has been one of building – lots of building. Building new offices and a state of the art demonstration lab; building a comprehensive research programme; and building a world class team of academics and business people who will help deliver the centre's ambitious objectives.

The team is fully established, the necessary funding available and all renovation complete. We are now ready for action.

This document lays out our objectives, strategies and plans for 2002 through 2003 and demonstrates how the University of Cambridge will help ensure that the Auto-ID Centre delivers the future it has designed.

## **2. EUROPE**

Europe comprises of 48 countries with a population of over 729 million and a combined gross domestic product of \$9,459 billion. At the heart of Europe's economy is the European Union (EU) which represents 15 countries and is considered one of the world's largest trading powers.

The EU was established in 1993 as an institutional framework for the construction of a united Europe. It was created to unite the nations of Europe economically so another war among them would be unthinkable. Its vision was to create a single market in which goods, services, people and capital could move as freely as within one country. However doing business on a European level is notoriously

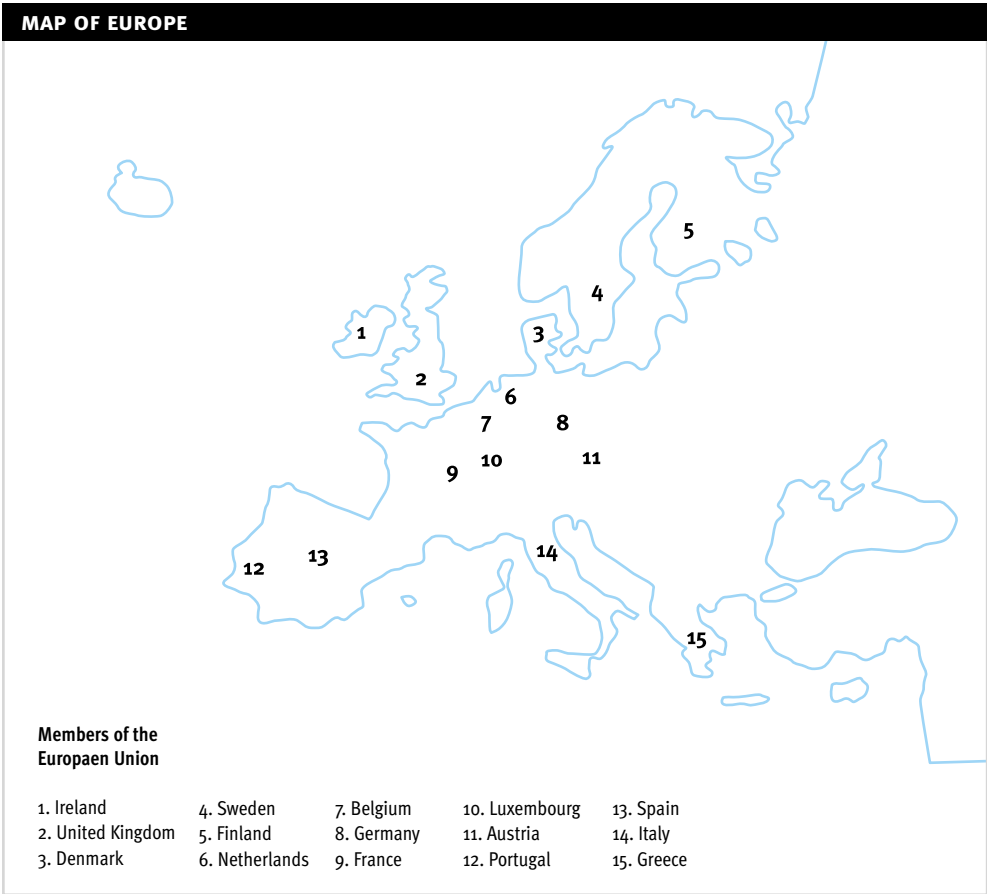
challenging with issues such as geography, language and monetary boundaries. The EU is also a major international trading hub. Some 20 percent of US exports abroad go to the EU, as does some 40 percent of US investment, making the EU one of the top two markets for the US.

It is clear to see the benefits Auto-ID could deliver to European businesses. It is also clear to see that adoption in Europe will be key to the Auto-ID Centre’s success.

Figure 1. EU Statistics  
Source: Eurostat, OECD

	EU-15	US
<b>AREA, 1,000 SQUARE MILES</b>	1,249.0	3,717.9
<b>POPULATION (MILLIONS)</b>	377.6	284.2
<b>POPULATION DENSITY/SQUARE MILE</b>	302.3	76.4
<b>UNEMPLOYMENT RATE %</b>	8.2	4.0
<b>CROSS DOMESTIC PRODUCT (BILLIONS \$)</b>	7,836.7	9,896.4
<b>GDP (VOLUME) % INCREASE 2000/1999</b>	3.3	5.0

Figure 2. Map of Europe



## 2.1. Objectives

The University of Cambridge centre has a number of objectives it must achieve over the next two years:

- raise **awareness** of the Auto-ID Centre in Europe
- ensure **acceptance** of Auto-ID Centre as a global initiative
- gain **sponsorship** from European companies
- ensure that Cambridge University’s **research plan** delivers against the overall global Auto-ID Centre’s goals

## 2.2. Strategy

These objectives will be achieved by:

- Creating a communication plan to raise **awareness** in Europe.
- Gaining **acceptance** by working with relevant trade, government and consumer groups
- Using existing databases at MIT and Cambridge Manufacturing Industry Links (CMIL) to target European companies for **sponsorship**
- Develop a comprehensive **research plan** that will help deliver the system and complements the work at MIT

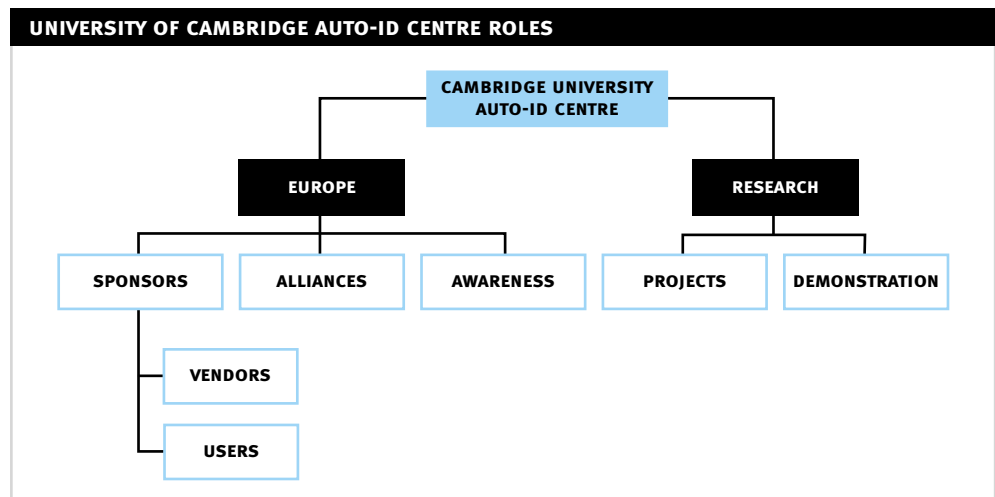
## 2.3. Roles and Responsibilities

The centre has two important roles.

It has a geographic responsibility to represent the Auto-ID Centre in Europe: recruiting new sponsors; representing existing European sponsor’s issues at the centre; smoothing the way for adoption by working with consumer groups and trade bodies; and generally raising awareness of the centre within Europe. This role will be the responsibility of the Associate Director, Helen Duce.

Its second role is to deliver world class research that will help deliver the Auto-ID Centre’s overall vision. The work will complement and build on the work at MIT but will also build on the Institute for Manufacturing’s expertise in the manufacturing supply chain. Research will be led by the Research Director, Duncan McFarlane.

Figure 3: University of Cambridge Auto-ID Centre roles



### 3. COMMUNICATION

Our challenge will be to raise awareness of the Auto-ID Centre in Europe **quickly** to the same levels as the US. If our end goal – a heavily attended symposium in 2003 – is to be met we need to do in six months what the US has done in two years.

The MIT Auto-ID Centre has been successfully working with the PR agency Fleishman Hillard since inception. The work has been purposefully reactive and trade/vendor focused. In Europe this work will not only need to be more proactive but will have to have a broader reach.

Communication objectives are:

- To raise awareness of the Auto-ID Centre within Europe with
  - vendors
  - end users
  - trade associations and governmental bodies
- To help generate new sponsors
- To anticipate and address consumer privacy issues
- To prepare for a European symposium in October 2003

#### 3.1. Events

The lab at Cambridge University has recently undergone serious renovation. On completion it will be equipped to demonstrate Auto-ID technology in action, clearly highlighting its benefits and applications. This will be an ideal opportunity to hold a 'lab launch' to generate awareness and enthusiasm with a wide number of different audiences:

- Potential European sponsors who have expressed interest in Auto-ID (from MIT Auto-ID database)
- Potential European sponsors who have affiliations with Cambridge University (from the CMIL database)
- Current sponsors with head offices or interested parties in Europe or with a specific interest in the Cambridge research programme
- Trade press and business press to generate publicity and interest in the centre and its activities.

#### 3.2. PR

To date, press activity in the US has been conducted mainly on a reactive basis. The activity in Europe will be more proactive, in order to quickly raise the level of awareness to the same level as in the US. A selected list of key publications will be identified and targeted. These will cover both trade and business publication across the whole of Europe. In order to support activities in Europe a UK representative from Fleishman Hillard will be appointed to oversee the European business.

#### 3.3. Conferences

Presentation at relevant trade and business conferences proved to be a very successful method of driving awareness in the US and this activity will be duplicated in Europe.

### 3.4. Web Site

The MIT Auto-ID website has been an essential tool, providing valuable information to existing, new and potential sponsors. A dedicated European section will be able to provide geographically specific information to sponsors and will also be an invaluable resource in supporting the efforts to gain new sponsors.

### 3.5. Symposium 2003

The Board of Overseers have requested that a Symposium be held in both the US and Europe in October of 2003. This event will be used to 'launch' the Auto-ID system to a very broad number of different audiences. This event will need to be publicised and then leveraged to generate maximum awareness. A detailed communication plan leading up to the event will be produced for the June Board meeting.

## 4. ACCEPTANCE

### 4.1. EPC Alliances

The US EPC alliance group offers a method of reaching a much broader audience than can be achieved by generating sponsors alone. The trade associations that sit on this group have the ability to disseminate information to thousands of member and to help represent their members' views and concerns. It will be essential to replicate this alliance in Europe in order to achieve wide-scale acceptance. In the US this team has also been charged with coordinating the 2003 Symposium and this will also be considered for Europe.

### 4.2. Consumers and Privacy

Privacy is proving to be a hot issue and it will be important to identify European consumer privacy groups and involve them in the development of the technology programme. It is important to remember that Europe is a continent, not a country and that we need to be sensitive to different concerns in different European countries.

The PR action group is working on developing and testing messages about privacy concerns as well as managing how the centre is generally represented publicly. While it may not be necessary to set up a separate European PR action group it will be important to duplicate the message testing work and PR guidelines in Europe.

The PR action group is also becoming more active in working with government departments and bodies. Again, this activity will be duplicated in Europe.



## 5. DELIVERABLES AND TIMINGS

Figure 4: Communication Plan

	Q102	Q202	Q302	Q402	Q103	Q203	Q303	Q403
<b>LAB LAUNCH</b>		X						
<b>CONFERENCES</b>	X	X	X	X	X	X	X	X
<b>WEB SITE</b>			X					
<b>SYMPOSIUM EUROPE</b>								X
<b>EPC ALLIANCE</b>		X		X		X		X
<b>PR ACTION GROUP</b>	X		X		X		X	
<b>CONSUMER GROUPS</b>			X			X		
<b>PRIVACY TESTING</b>			X				X	

## 6. SPONSORSHIP

Recruiting new sponsor to the centre will be one of the main aims of the lab. It is essential to our global vision that European end user businesses are well represented on the Board of Overseers. It will also be to our advantage to have European vendors working to provide technology solutions to this huge global market.

A number of methods for recruitment will be used.

The Auto-ID Centre at MIT has an existing database with nearly 1000 companies. European based businesses that have shown an interest in the past will be frontline targets. The new lab and Auto-ID demo will be used as a 'foot in the door' to arrange meetings.

There are many advantages of having the lab at the University of Cambridge. Cambridge Manufacturing Industry Links (CMIL) has many strong links to European business and industry consortia. We are already working with their team to identify specific businesses and to set up introductory meetings.

Another Cambridge advantage is the many events and courses the Institute for Manufacturing holds each year – all of which can be used to generate awareness among potential sponsors.

Finally, attending conferences proved to be one of the most successful tools used in the US to generate interest from potential sponsors. As mentioned previously, attending conferences will be a very strong component of our plan.

We will also play a major role in ensuring that current sponsors' needs are being met. There are already a number of businesses on the Board who will need support in Europe.

### 6.1. Sponsorship Goals

The goal for the number of sponsors has been loosely based on the experience of MIT Auto-ID Center, with an added dose of optimism.

The centre already has a number of ‘heavy hitters’ and leveraging the calibre of these existing sponsors will considerably oil the way for new sponsors. Also, to some extent, the more sponsors we have the easier the job becomes and we have already begun to witness the ‘tipping point’ phenomena in a number of industries.

The aim will be to generate \$1.8 million in sponsorship in 2002 and \$3.1 in 2003. A total over two years of just short of \$5 million.

Figure 5: Sponsorship Goals

	END USERS	VENDORS	TOTAL
<b>SPONSORS</b>			
2002	5	9	14
2003	9	14	23
<b>TOTAL</b>	<b>14</b>	<b>23</b>	<b>37</b>
<b>MONEY ('000\$)</b>			
2002	\$1050	\$800	\$1850
2003	\$1800	\$1300	\$3100
<b>TOTAL</b>	<b>\$2850</b>	<b>\$2100</b>	<b>\$4950</b>

## 7. RESEARCH

The research work at MIT has built an infrastructure for getting product identification onto a network and being able to track and store information about that product

This first step for automatically identifying product is all about gaining more **information** and delivering greater visibility along the entire supply chain. This should lead to major improvements in speed, accuracy and information quality and in turn will lead to considerable cost reduction.

The next step is to ask ‘once we have automatic identification and greater information and visibility how can we use this to fundamentally alter the way products are made, moved, used and disposed of?’

The ultimate vision of the centre is to create smart products – products that can interact and make decisions without human intervention. Examples include fettuccine that tells the microwave how long it should be cooked and the washing powder that knows the ideal wash cycle for the load it is washing. In order to achieve this, products need to be able to:

- Communicate:** “I’m fettuccine”  
“I’m a microwave”
- Negotiate** “cook me for 3mins at 600 watts”  
“No – I can only cook at 800 or 1000 watts”
- Make decisions** “then cook me for only 2 minutes at 800 watts and then for 1 minute at a 1000 watts”

This is about taking **decisions** and acting on them.

The control research group at the University of Cambridge Auto-ID Centre will focus on the fundamental issues associated with this Decision Area and will consider various novel applications in

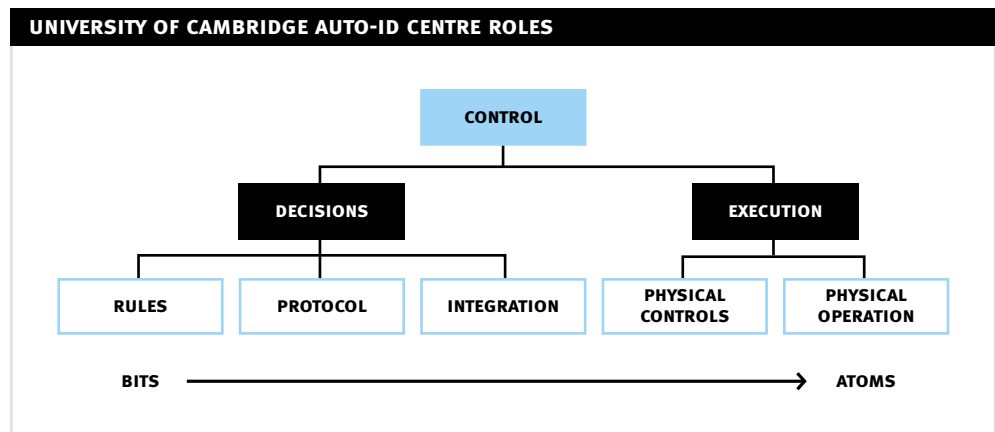
- inventory management
- production control
- domestic functions
- distribution

The control research will be coordinated at the University of Cambridge but will work closely with the team at MIT as the work is linked to the languages development group and there is significant control expertise at MIT. There will also be a need to work closely with Robin Koh's application group as the work that is developed will ultimately become applications.

## 7.1. Organisation of Research

The control group is split into two sub groups Decisions and Execution. To a great extent the execution work is contingent on the decision work. The work will shift from the world of 'bits' and the manipulation of information - 'decisions' - into the physical world of atoms where information is turned into a physical action - 'executions'.

Figure 6: University of Cambridge Auto-ID Centre Research Group



## 7.2. Elements of Research

### 7.2.1 Control

The definition for control in a manufacturing sense is 'the process of adjusting appropriate variables in order to direct performance of an operation toward a target level'. So with our fettuccine the variables would be power level and time and the performance target would be a correctly heated end product.

#### 7.2.1.1. Decisions

Decisions describe the process for determining suitable instructions for improving performance based on targets and on the current conditions.

#### RULES

In order to make a decision there needs to be a defined set of rules within which to operate. With our fettuccine the rules maybe that it has to be heated to 70 degrees and that it must reach this heat level slowly to preserve flavour.

#### PROTOCOL

Protocol defines the way in which the rules are used to provide a solution. We know what we need to achieve with the fettuccine but protocol defines how. It may define that the fettuccine first communicates what it is, then it finds out the power level of the appliance, then it sends instructions based on its rules (3 minutes if it's 600 watts, 2 minutes if it's 800 watts etc).

#### INTEGRATION

Integration is about ensuring that the information we generate and the language we speak can be understood and integrated into existing decision making and information systems, such as SAP etc.

##### 7.2.1.2. Execution

This is about executing 'decisions' or 'instructions' in a suitable manner. There are two elements to executions.

#### PHYSICAL CONTROLS

This refers to physical hardware, software and wiring required to execute the decisions within the Physical World.

#### PHYSICAL OPERATIONS

Physical Operations is where the bits finally meet the atoms and where physical actions actually take place. It covers everything from conveyors and material flow, to automated robots, to sophisticated domestic appliances such as internet enabled microwave.

### 7.3. Demonstration

Demonstration will be the backbone of our research plan – only in making this real will we be able to learn and fully develop the technology.

The purpose of the demonstrations will be to illustrate the applications and benefits of Auto-ID within current supply chain capabilities. It will illustrate how decisions based on product identification can be used to improve current operations.

As inspiration we may also demonstrate some more advanced supply chain applications, however the bulk of the work will be based on current sponsor operational capabilities.

The demonstration will be split into three main phases:

#### **1. Phase 1 – June 2002**

- a. Product storage and retrieval (gift packs)
- b. Simplified product assembly

#### **2. Phase 2 – Nov 2002**

- a. Intelligent simple product assembly (gift packs)

#### **3. Phase 3 – June 2003**

- a. Intelligent complex product assembly (e.g. mobile phone)
- b. Consumer appliances

In each phase the following will be delivered:

- A simulation of the physical demonstration (4 months prior to demo)
- A live demonstration
- A white paper outlining learning's, applications and benefits.
- A small Field test (if viable)

At each stage research developments from MIT and Cambridge (such as PML and Savant applications) will be integrated into the demonstration.

A separate technical paper has been produced outlining in detail a two year work plan for demonstrations. All demonstration will be held at the Cambridge lab.

## 7.4. Field Test

At the November Board meeting the Cambridge team were asked to look at the possibility of replicating the US Field test.

We have been meeting with sponsors and working with the Field test action group to define objectives and parameter for a European based Field test. A recommendation will be presented to the Field test on January 30th and a first proposal will be presented to the Board at the February Board meeting.

We do intend to look at Field tests as part of our research programme. For Phase 1 and 2 these would take place within sponsor manufacturing supply chain. There are some issues with this. Participating sponsors may feel uncomfortable in sharing information specific to their operations, as it will be more difficult to mask specific findings. However, I am sure these issues can be overcome.

Phase 3 would look at an in home field test and would only be considered viable if we are comfortable with consumers' reactions and have a proven, reliable plan for dealing with privacy concerns and media coverage.

## 7.5. Current Research Activity

Much of the planned research is already underway with activity in

### **Control**

- A white paper scoping and rationalising control systems will be presented in February 2002
- A white paper on the Intelligent supply chain will be presented in February 2002

### **Decision – Integration**

- A White paper on methodologies for Integrating Auto-ID data into Information Systems is due in Nov 2002

### **Executions**

- The simulator for Phase 1 will be presented in February and the demonstrator for June 2002.

## 7.6. Planned Research Activity

There are a number of key gaps within our research plan

### Decisions – Rules & Protocol

- A white paper and software demonstration are required and we will need to hire a PhD or RA to work on this area

### Execution – Physical Control

- A white paper and software demonstration is required and an additional PhD or RA will be hired.

### Execution – Physical Operations

- A lot of work will be required in this area over the next two years to deliver the three phases of demonstrations and associated deliverable. At least one RA is required and a full time Lab technician.

## 7.7. Deliverable and Timings

Figure 7: Research Plan  
WT – White Paper  
FT – Field Test

	Q102	Q202	Q302	Q402	Q103	Q203
<b>CONTROL</b>	WP					
<b>RULES &amp; PROTOCOL</b>	WP			Software		
<b>INTEGRATION</b>	Project Spec			WP		
<b>PHYSICAL CONTROL</b>					WP	Software
<b>PHYSICAL OPERATIONS</b>						
<b>PHASE 1 DEMO</b>	Simulation	Demo			WP & FT	
<b>PHASE 2 DEMO</b>			Simulation	Demo	WP & FT	
<b>PHASE 3 DEMO</b>				Simulation	Demo	WP & FT
<b>READERS</b>	Project Spec	Demo				
<b>SMART SC</b>	WP					

## 8. BUDGET

A budget of £1.5 million has been estimated for 2002 through 2003. This will cover all full time staff, research students, office development, computer and demonstration equipment, travel and European Marketing activities.

Figure 8: 2002 and 2003 Budget

	2002	2003
<b>STAFF</b>	£290	£340
<b>STUDENTS</b>	£78	£90
<b>EQUIPMENT</b>	£235	£55
<b>TRAVEL</b>	£180	£130
<b>MARKETING</b>	£55	£47
<b>TOTAL</b>	<b>£838</b>	<b>£662</b>
		<b>£1,500</b>

