




20 years of enterprise - lessons learned and challenges for the future

Professor Mike Holcombe
Department of Computer Science
epiGenesys Ltd




Sheffield Software
Engineering Observatory

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Murder in Doncaster


- Two years ago someone was murdered in the town
- On returning from the scene of the crime the first thing the detectives did was to consult DOMINIC



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DOMINIC


- Most murders are related to Domestic violence incidents
- DOMINIC is the Doncaster Police's dedicated Domestic Violence Information System, it contains all known records of incidents in the area
- There are over 6000 such incidents each year
- DOMINIC contains details of victims as well as 'villains'



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DOMINIC continued

- National databases only feature the villains
- Victim support is a vital aspect of police work and an integrated system was needed
- Initially a commercial software house was contracted to build DOMINIC
- Although full payment was made no software was ever supplied



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- Now, however, DOMINIC is up and running,
 - it was installed in July 2003,
 - it contains many thousands of incidents,
 - it is used daily
 - and it has never crashed
- It is a vital resource for the police and support agencies and NGOs involved in victim support
- Dominic was built by 2nd year students at the University of Sheffield as part of their course – the Software Hut
- The Software Hut has been running very successfully for 20 years



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Software Hut

- Founded in 1987
- All 2nd year students are involved in this
- Teams are formed of between 4 – 6 students
- 3 or 4 external clients are found
- Each client works with 4 - 6 different teams
- The teams compete to build the best solution
- The exercise lasts from February to June
- Students spend 15 hours per week on their project
- 20 credit module



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Software Hut

- All are REAL projects with REAL clients
- Good requirements capture is key
- We cannot imitate the clients or fabricate their businesses
- The clients are very serious about the exercise
- High quality systems MUST be produced
- Solutions have to contain full documentation for users and maintenance

More Software Hut projects

2005

Medical PDA system part I
Property web site
SAP recruitment system

2006

Medical ethics web site
Medical PDA system part II
Hospital research database

2007

Medical information system
Document archive system
Charity HR system

2008

SMS system
Social website
Teaching admin system

Software Hut example 2006

- Web site for Health professionals
- Training emphasis
- Emphasis on building a community
- Built by 2nd year students



Software Hut Solutions

All 2nd year students are involved in this. Teams are formed of between 4 – 6 students. 3 or 4 external clients are found. Each client works with 4 - 6 different teams. The teams compete to build the best solution. The exercise lasts from February to June. Students spend 15 hours per week on their project. Accenture provide a training course

Genesys Solutions

- A real, commercial software house run by advanced masters students
- 4th year MEng and Advanced MSc
- Typically 40-50 personnel
- Own business premises and independent network and equipment – mainly open source based
- 15 hours per week on this activity over 2 semesters
- Professionalism stressed – coding standards, high quality processes, latest agile technologies used

Genesys Solutions

- The company operates exactly like a real one
- Real commercial projects are carried out
- The students have a major responsibility for the running of the company, decision taking, project management etc
- We, the tutors, act as advisers only
- Running successfully for over 15 years

Genesys Solutions

- It is run as a business
- We aim to make a profit each year shared amongst the students
- There is a Marketing group
- Genesys has its own computer systems and student administrators
- There are a number of specific project teams
- Genesys has developed its own design methodology based on Extreme Programming

Infrastructure

- Eclipse IDE
- Test tools
- Story tracking tools
- Professional manager
- Senior mentors from IBM visit every term and are available for students to consult on technical and business issues
- Strong support from Microsoft – Microsoft Innovation Centre proposal
- Regular visits from Accenture, Deutsch Bank, etc.

Some recent Genesys clients

- Cancer Research Campaign (CancerUK)
- HDSports
- Great Ormond St. Hospital
- I-SKY
- Text4Offers
- MEDILINK
- IBM etc.
- Royal Armouries Leeds
- Cystic Fibrosis Trust

Making it as realistic as possible

- A number of leading companies are getting involved in the teaching of these activities
 - IBM
 - Accenture
 - Deutsch Bank
 - Microsoft
 - etc
- This increases the quality of the student experience
- And makes them take a more professional approach

Lessons from 20 years of Enterprise



- Two cohorts in Genesys every year – 4th years and MSc students
- MSc students have never done this before – and it shows
- They need intensive training and a massive culture change
- Enterprise is not just an 'add on'
- *We need to start from day 1, year 1*

Some examples

- E-commerce site with integrated automatic stock control
- Built in asp.net





- Game for Royal Armouries
- Based on 100 years war in France
- Capturing a castle
- Features images from contemporary manuscripts and tapestries
- Showcases exhibits of armour and weapons
- Extensive graphics rendering

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- Web site for Cystic Fibrosis Trust
- Sponsored by pharmaceutical company
- Provides advice about diet and medication for children
- Close collaboration with medical researchers and doctors

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- Social networking site for architects
- Features virtual city centre – Sheffield
- Actual buildings and information about them
- Users can give feedback about the city centre buildings




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Other recent projects


- Iceberg tracking
 - Satellite feed for shipping
 - Identifies and tracks icebergs over time
 - Based on University research
- Bluetooth project
 - "Who wants to be a millionaire?" type quiz system
 - Sends questions to mobiles, gathers and presents results
- On-line training course on hazard waste disposal for University
- Randomised clinical trials system for University



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Actors in Genesys


- Initial client contact
- Contract management
- Team Management
- Event organisation



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Actors in Genesys

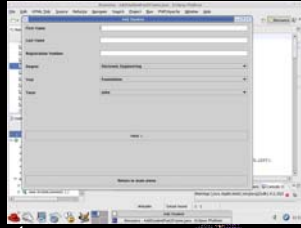
- System Administration Team
- Windows and Linux System Administration
- Setting up entire network for Genesys
- Providing professional service to Genesys and to Genesys' customers
- Automated back up, mirror servers, GRID facility



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Actors in Genesys

- Three teams
- Work on projects
- Direct contact with client



Genesys Work Environment

- Support for setting up your own company
- Time Management Scheme
- Automatic logger and timesheet generator
- Monthly Board meeting making decisions
- State of the art Servers and Clients
- Latest software technologies

New premises in the Enterprise Zone (EZ)



Brand is very important

- Templates and systematic processes are key
- Quality assurance is vital
- Professional attitude is important
- Team spirit is critical
- Dealing with real problems and awkward people is a major skill needed

Advantages for students

- Employers love it - at interviews it is all they want to talk about.
- I am inundated with employers wanting to recruit our students.
- Students are ready to be productive in industry.
- It is a good training for research students as well.

Most of this year's Genesys students have had excellent job offers:

Typical salary £36k plus bonus and benefits.

- IBM
- HP
- Fujitsu,
- Standard Bank
- Accenture

Several have set up their own companies
Many also go on to do PhDs and are usually excellent.

The problem of assessment

- We collect a lot of data.
- Students log in to the lab and we have their timesheets
- We manage each team weekly
- Genesys Students chair a Monthly Board Meeting
- Self assessment process is used for all
- Individual interviews held twice a year

Win, win, win, win!

The students win, it's real and rewarding

The clients win, quality software and analysis

The academics win – research in context

The University wins – industrial relations, student numbers

Summons to the Secretary of State for Education



To brief him on Genesys.

His view:

“An excellent idea”

Why don't other universities do it??

But is it as simple as that?

Real enterprise is not just an 'add-on'

Putting unprepared students in front of a real commercial client is highly risky

Enterprise has to be a core part of the curriculum

Core educational principles

Group Projects are the core of our curriculum – starting from Day 1, Year 1.

Crossover project – a pretend software development project as part of the Requirements Engineering and Design and Testing modules.

Immediately shows how the theory we are teaching relates to engineering

Infrastructure

Students use a specially designed management tool – minutes, timesheets
Agile process used by all – XP
Very short iterations – weekly builds
Test server to manage all testing
Lightweight notation for system architecture



Learning how to cope with reality

- Our 1st year students are involved in a team project designing a complete software system from Day 1
- Even though they may not know how to write a program
- The first semester is spent:
 - Learning how to work in teams
 - Dealing with a (proxy) client
 - Preparing a business analysis and software proposal
 - Formalising the design
 - In Semester 2 they build and test it

Lessons (continued)

- Real life is messy - text books give a very simplistic view!
- It is full of people – politics and psychology intervene
- Clients can be a challenge to deal with
- Quality is absolutely vital – including documentation
- The client's needs will be hard to establish
- They never know what they really want!
- After sales will be important – CRM matters
- Marketing is vital – it is expensive and time consuming
- Finding and keeping clients/customers is what it is all about



Some issues for Enterprise Educators?

- Are we emphasising the really important aspects?
- Business plans are all very well but 90% of start ups fail despite having business plans approved!
- We need to emphasise the following:
 - Understanding your market, test it out;
 - Being flexible about what you are selling;
 - Cultivate your customers;
- Try things out in the real world
 - Learn from experience not from lectures and games;
 - Play to your strengths, knowledge, contacts etc.



The 'dark side'

- Enterprise is not all fun!
- Some clients are VERY unpleasant
- There is a lot of BORING stuff to do
- It is very hard work
- It may not result in big money
- It can be very lonely
- 99% perspiration and luck
- 1% inspiration
- Planning cannot be ignored



Enterprise for the Knowledge Economy

- Some of the most impressive enterprise achievements are by graduates who use the *knowledge and skills gained in their academic degrees*
- It is much more important for the country that we exploit the knowledge economy in enterprises than it is to set up businesses that have no connection with what the graduates have studied
- Selling ring tones or running a business cleaning professionals' flats does not require attendance at university
- Most graduates have expertise in information retrieval, analysis and synthesis in specialist subjects – exploit it!



New directions for Enterprise

- Communal incubators
- Co-operative partnerships for support, competition and prototyping
- Web2 start up landscape – NetStart – M62 corridor (www.thenetstart.org)
- Agile enterprise – rapid evaluation – try it out – rather than producing endless plans based on phoney market research
- Ideas creation a big problem – how is it best done?
- Challenge academic departments to get involved
- Take risks and go for the innovative ideas
- There is probably more to gain by exploiting the ideas of our graduates than the ideas of our professors!
- Universities are obsessed with exploiting research IP rather than the skills and knowledge of its people

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43

New directions for Enterprise

- A more professional experience for students
- Potential for expansion
- Involvement of other University students
- New graduate opportunities
- Regional wealth creation
- Benefits for the University



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44

The Future for Genesys - epiGenesys

- University spin out company
- epiGenesys Ltd
- Principal business:
 - Servicing University departments
 - Exploiting University research by developing products
 - Supporting University training needs
 - Commercial software development for businesses and organisations
 - Low cost projects for charity



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45

Sheffield Graduate Award

- Based on extra-curricula activities
- Six key areas
 - Enterprise
 - Student Jobs and Work Experience
 - Volunteering
 - Cultural and Social Awareness
 - Extending International Horizons
 - Activities Supporting the Institution
- Employers are looking for people who can demonstrate that they can stand out from the crowd
- "I think it is a really well run programme that has been helpful to me in identifying skills gained through my university experience and has therefore helped me to put together an impressive looking CV" **Gina, Politics, 2007**



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46

Use your experiences as a research opportunity

- The data you can collect from real enterprise start-ups is invaluable
- What makes a start-up successful – how can this be measured?
- What are the characteristics of success in this?
- How important is the people dimension – what personality types generate the most successful start-ups?
- Is there a generic start-up process that we could discover?
- Can this be generalised to other business contexts?



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47

The connections with Research

- We are able to study real software development projects in great detail
- We can carry out comparative scientific experiments looking at the use of different design methodologies
- None else can do this
- We have a £500k EPSRC grant – Sheffield Software Engineering Observatory



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48

Our early empirical research

- Having the Software Hut meant that we could do some comparative studies with real development projects
- Initially this was comparing agile methods with traditional design led approaches
- Francisco Macias ran some experiments over 3 years [PhD thesis]



People issues

- We began to realise that individuals were as important as methods
- Sharifah Seyd-Abdullah looked at well-being as a psychological concept and how it related to method [PhD thesis]
- John Karn looked at personality and team behaviour [PhD thesis]



Some current research directions

- Chris Thomson looks at change pre-delivery (during requirements capture and implementation) – its causes and consequences, lightweight formal notations and testing – and tools for empirical software engineering
- Chris also looks at client-developer communication
- Liang Huang looked at Test First programming [MPhil thesis]
- John Karn studies personality and conflict
- George Michaelides looks at Group cohesions
- Andrea Smith considers openness and creativity and agent-based models of groups



Archives of real project data

- With all this data could we provide something new?
- Many empirical projects involved students doing simple tasks
- We looked at the full life cycle
- We also had clients – they are a major influencing factor



Observatory

- A successful bid to EPSRC in collaboration with then Institute of Work Psychology enabled us to start work on a larger scale
- We aim to make much of our data available to other researchers
- It is confidential in terms of business content etc. but we will develop appropriate agreements



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