Southampton Institute Maritime Research Centre

Future higher skills needs of the marine technology sector in the South East of England

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SOUTHAMPTON INSTITUTE

FUTURE HIGHER SKILLS NEEDS OF THE MARINE TECHNOLOGY SECTOR IN THE SOUTH EAST OF ENGLAND

A report prepared for the South East Regional Development Agency

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SEEDA BURSARY SCHEME.

The South East England Development Agency (SEEDA) launched a rolling programme for funding postdoctoral fellows in South East higher education institutions to investigate skills shortages for the knowledge economy in October 2000.

The scheme, managed by Higher Education South East, the South East HE regional consortium, and supported by Skills Insight, the regional skills observatory, SEEDA sector groups and other partners, aimed to develop detailed understanding of future skills needs in specific sectors using the region's HE research base. Stronger HE/industry relations and provision that reflects the needs of the region's future knowledge based economy should also result.

The first three bursaries focus on the Media & Creative, Marine Technology and Tourism sectors, involving the Surrey Institute of Art & Design, Southampton Institute and the University of Brighton respectively. The reports identify growth points for new industries and anticipate future skills needs. SEEDA will fund further Bursaries in Spring 2002.

This project received funding from the SEEDA Fund for Learning and Skills.

EXECUTIVE SUMMARY

This report aims to analyse future higher skills needs of the boat building and marine electronics industries in the south east of England and to investigate the relationship between higher education providers and the sector.

Chapter one: Methodology

To achieve this a series of interviews with employers, education providers, industry and governmental agencies were conducted as part of a situation analysis. Both demand and supply factors were then identified that could affect emerging skills needs for the future. The analysis also included current issues that were highlighted during the situation analysis.

Chapter Two: Sector description

The marine leisure market in particular has enjoyed a period of steady expansion of approximately 10% annually over the last seven years. The sector in the south east is centred in the Solent area and has become a major employer. The revenue of the marine leisure sector in the south east region in 2000 was estimated at £664 million and employs some 8834 people. Most boat builders in the region, and some electronics companies have evolved from cottage industries. All but one of the boat builders included in this research were run by an owner manager.

Chapter Three: Situation Analysis

Findings: boat builders

The skills problems that boat builders faced were more fundamental than was first thought. There is a parlous shortage of skilled craft workers and technicians. Competition for skilled workers is intense; this is causing local wage inflation. Recruitment of new workers through the modern apprenticeship scheme appears to be insufficient because of high rates of attrition. Moreover, the scheme appears to be falling short of fulfilling the needs of employers and employees.

There are few opportunities for graduates in the boat-building sector. Employers claim that new graduates lack practical experience and hands-on ability. However, no employer in the survey had any knowledge of financially assisted schemes whereby students or graduates can gain

practical experience. There was little interaction between the sector and HE institutions in terms of student support, course development, research, consultancy etc.

Many line management and design roles were found to be filled by people who were former craft workers. Although some graduates were found in these jobs, employers generally preferred not to place people without practical backgrounds into them. However, there are no recognised courses or qualifications for line management jobs.

Owner managers complained about the situation, but none in the survey were developing a strategy to overcome the shortages. The management style of boat builders appears to be a major factor in the manpower issue. An analysis of studies of other types of small firms showed this behaviour to be typical.

Marine electronics

Small firms in this sector also faced similar problems to that of boat builders, i.e. they found it difficult to recruit people with the right blend of knowledge and practical experience. This was further compounded by the lack of recognised qualifications and training provision.

The manufacturing sector was more prepared to recruit and train graduates. However, companies reported that they were experiencing problems recruiting experienced and well qualified management and engineering staff.

Chapter Four: Management skills

Evidence drawn from the interviews for this study also demonstrated a gap in terms of management skills. Management views concerning employment appear to be rigid and narrow, typically relationships with their work force seem polarised; whilst poaching is rife, there appears to be little effort made to retain people in ways which are not financial. Employers appeared happy to complain, but felt powerless to intervene.

Views on new methods, techniques, business processes and materials seem outdated and cynical, effort seems to be directed to sales and the completion and finishing of products. Owner managers were reluctant to employ graduates in their companies, citing the fact that they were not immediately useful and would prefer to employ supervisors, project managers etc with craft backgrounds. Focus was nearly always upon these key skills.

Existing research that had been carried out into the management of small companies confirmed that these traits are typical. Owner managers are invariably driven by the nature of their product, they focus upon production and key skills. There was little appreciation of long term business strategy to cope with current and potential problems.

Chapter five: Factors affecting future skills needs

Technological impacts: boat building

The development of new materials and manufacturing technologies are unlikely to have any great impact upon the skill needs of boat builders in the next seven years. This is because they do not add sufficient value to the majority of products built in the region. The industry is more likely to be affected by the supply of skills.

Technological impacts: marine electronics

The electronics industry will move towards generic hardware solutions for new products with an increased emphasis on software. This will impact not only on the skills needs of designers and manufactures, but also on the needs of those who fit and maintain equipment.

Economic factors

Although at the time of writing the economic outlook is uncertain for the short term, for the long term future, forecasts indicate that the sector will continue to grow, albeit at a slower pace than recent years.

The micro economic factors that were thought to affect the supply of skills in the region included the relatively high cost of housing in the Solent area as well as the low unemployment.

Demographics

Although the numbers of young people in the target age range for apprenticeships will increase by ~5% in the region by 2004, it was not thought that this would have any great impact upon the problem. This increase will be mitigated by high wastage rates of apprentice cohorts and by Government policy aimed at increasing participation in higher education to 50%. Inward mobility of skilled workers will continue to be also affected by the relative high costs of housing in the Solent area.

Trends in education

Relevant higher education provision nationally is still wide, although engineering courses are threatened by a decline in the numbers of applications. This is particularly severe in respect to HND courses. Although the numbers on IT related courses are rising rapidly, the lack of applications to more traditional engineering courses will cause employers problems in the future.

Funding restrictions have prevented many HE institutions from providing their students with a great deal of practical experience in their workshops and laboratories.

Chapter seven: Conclusions

The research found that the skills problems faced by the industry are more fundamental than originally thought. A serious mis-match was highlighted between the demands of employers and the supply of skills from the regional labour market. The way that the industry recruits trainees, its outlook on the labour market and the utilization and employment of graduates needs review. If a strategy is not put into place to remedy these problems, they will pose a serious threat to businesses that depend upon the skills of their workers.

The lack of a strategic approach and the lack of cohesion and co-operation within the industry is indicative of the style of owner managers of small firms in the sector. The industry not only needs support from relevant organisations but also the skills of owner managers need to be expanded.

There needs to be more interaction between the industry and higher education. Not only does this need to be done in relation to full time courses and students, providing students and graduates with more opportunities to gain practical experience, but also in terms of developing a support infrastructure for the industry through advice, research and specialised training.

Overall, so long as the forecast expansion of the sector becomes a reality in the next seven years, employers need to realise that the labour market will become increasingly supply driven.

TABLE OF CONTENTS

NOMENCLATURE

BMIF	British Marine Industries Federation. Industry body and NTO for UK marine leisure industry
Boat building	The manufacture of sailing yachts and dinghies, motor yachts and power boats, day boats and working boats.
CAD	Computer Aided Design
EMTA	Engineering and Marine Training Organisation: NTO
FE	Further education, vocational training colleges
FRP	Fibre Re-enforced Plastic: a generic name for fibreglass, in this report it is used to mean more advanced materials than GRP.
GRP	Glass Re-enforced Plastic: often referred to as fibreglass. This is the most common boat building material consisting of layers of glass strands in a polyester resin. Compared to FRP it is low cost and requires less skill to use than other materials.
HE	University sector
Laminator	A skilled crafts person who 'lays up' fibres and resins to produce a FRP / GRP product or mould.
Marine	In this report the word is used to differentiate the leisure and working boat sectors from that of shipping (maritime).
Marine electronics	The design, manufacturing and fitting of navigation aids and instruments for yachts and other small craft.
NTO	National training organisation
NVQ	National Vocational Qualification
SME	Small to Medium Enterprise

1. INTRODUCTION

This report has been prepared by Southampton Institute Maritime Research Centre based upon research that has been carried out into future higher skills needs in the south east of England's marine technology sector. The research has been funded by the South East Regional Development Agency (SEEDA) and managed by Higher Education South East (HESE).

The overall aim of this pilot project was to investigate possible future higher skill shortages within a 5 to 7 year time scale in the marine technology sector, and also to investigate the relationship between the sector and higher education.

1.1. DEFINING 'MARINE TECHNOLOGIES'

The maritime industries in SE England are very diverse; defining "marine technologies" is a complex issue.

Within SEEDA's[1] own definition of established and emerging sectors in the region, marine technologies fall into various sectors: Electrical /electronic engineering, Defence (marine and aerospace), Port activities and Tourism. The Marine Foresight panel recognise (Pugh & Skinner, 1996); Offshore Energies, Maritime Transport and Construction, Marine Fisheries and Aquaculture, Exploitation of non-living Marine Resources, and, Coastal Waters and Maritime Leisure. For the purposes of this study all of these listings are too narrow and restricting, and do not reflect the situation in the region.

The table below lists possible sectors to be investigated based on sector definitions used in the 1992 Standard Industrial classification of Economic Activities. These are preferred because they provide a wider definition and reflect activities in the SE.

[1] State of the Region: An Economic Profile of the South East of England, (2000). SEEDA, Guildford

Industrial Sector	Marine Activities	Business types in SE
Agriculture	Fisheries Aquaculture	Fishermen Fish / shellfish farmers
Manufacturing	Ship building Ship repair Boat building Instrument manufacture	Ship builders / yards Ship repairers / yards Marine engineering consultants Yacht and workboat builders and repairers Marine instrument and equipment makers
Construction	Sea defences and harbours	Civil engineers and consultants
Transport and communication	Freight Passengers Cables	Ports operations (cargo) Port operations (marine) Shipping services Ferry services
Financial and business	Insurance Research	Independent surveyors and consultants Classification Shipping agents Research and consultants
Public Administration	Navy Policy Safety	MCA – SAR – Port and flag state admin Police (marine)
Education and health	Universities Research laboratories	Marine training Marine education Marine research
Other services	Sewage disposal Marinas	Marina and small harbour management Water discharge authorities Coastal zone management

In order to ascertain priority areas for the purposes of this study however there were further considerations.

- To identify which of these sector groups are important to the south east area?
- Which of these groups rely, or may rely, in the near future, upon skills that can be generated through higher education?
- Of these sectors, which are likely to be major employers (and higher skill utilisers) in the required time frame?

According to a report prepared for the Marine Foresight panel(IACMST, 1998) the largest areas of growth for marine technologies over the next few years are in leisure boat building, aquaculture, R&D, and biotechnology. The smallest, are shipbuilding, marine equipment, and ship repair.

Sector	1999 £bn	2004 £bn	Growth %
Leisure boating	25	29	16%
Aquaculture	14.7	18	22%
R&D	12.7	14.6	14%
Biotechnology	0.5	1.5	200%
Ship building	21.66	21.44	-1%
Marine equipment	9.7	9.6	-1%
Ship repair	5.5	5.5	0%

Research and development is a strong growth area, as seen in the Foresight data above. However this activity tends to be fragmented, or otherwise feeds into mainstream industry. Biotechnology is still very much in its infancy, and although growth is high, it is an industry that is at present, very small. In order to ensure success of the project, a sector needed to be studied that represented a major employer and had existing networks and industry associations in place.

Ship building is thought at the nadir of a world cycle at the moment. An increase in new buildings is forecast to take place after 2004; it is not represented in these figures. The importance to the region as a whole, and thus to this study must be questioned, as there is only one major ship builder in the south east. Furthermore, much skills research has already been carried out in this sector on craft and technical roles, by the Ship builder's and Ship repairers' association (SSA).

It was concluded therefore that this was a likely sector for study. The sector is dependent upon the skills of designers, manufacturing technologists, mechanical and electrical engineers, managers (especially project managers) and technologists. Moreover, anecdotal evidence from the industry, suggests that such a skills analysis was needed.

There was also considerable added value in concentrating on this sector. Many of the skills types are common to other, similar sectors, such as work boat design and construction and also specialist craft manufactures such as builders of high speed ferries and hovercraft. These employers were included in the study. Furthermore, many of the higher skills involved with this industry, on the supply side, are also associated with

ship building, E.g. undergraduate degree programmes in naval architecture and marine engineering.

This research therefore concentrated on the boat building and marine electronics industries because they were identified as being significant employers within the south east of England. These types of employers range from very small companies to larger firms who employ several hundred people. The majority of these companies are situated in the Solent area of Hampshire and West Sussex. Originally the study aimed to include marine engineering. However, it was found that this sector in the UK is centred in the Dorset area, thus excluding it from this study.

1.1.1. The sector

At the outset of this research, which had started in April this year, the authors hypothesised that changing technologies and market pressures would have a direct impact upon the skills of those in the industry. For the marine electronics sector, this appears to be the case. However, in boat building, the problems facing employers appear to be very different: the skills problems were more fundamental and also more abstract than originally perceived.

In the main, the products that are produced by boat builders in the region tend to be high quality, and consequently relatively high value. They also appear to compete in a conservative market: innovative processes and materials are overshadowed by more traditional approaches and technologies. Therefore builders in this market are highly dependent upon a skilled workforce of craftsmen and technicians. Although craft skills have never been considered “higher skills” in relation to higher education in the UK, this may change in the future.

Boat builders’ perceived need for traditional degree type skills is consequently low. All the employers that were contacted for this study reported that they were experiencing problems recruiting both trainee and experienced craft workers. For boat builders in the southeast, this appears to be the nub of the problem, rather than the levels of graduate employment or skills.

1.2. METHODOLOGY: LEARNING NETWORKS

The study of future emerging technical skills needs in small business sectors required a flexible approach. Quantitative occupational forecasting models based upon data generation through questionnaires,

could not have provided the necessary insight. A different approach was therefore needed.

A consortium of marine European training and education providers developed the "Learning Networks" methodology used for this project during the course of the MARSK project[2].

It provided a more flexible approach to that of quantitative occupational forecasting models and concentrates upon changing and emerging skills requirements rather than upon job roles. It is an holistic and forward thinking approach to the analysis of skills needs, based on the idea that by the time skills shortages are beginning to effect industry, it is too late to deploy a strategy as a remedy.

Learning Networks takes into account both the supply and demand sides of the skills equation. The analysis is based upon modelling skills situations five to seven years ahead, rather than concentrating on current problems. There are two main benefits to this: a deeper understanding of the dynamics that will affect the skills situation for employers. Secondly, it can be used as justification for development of and investment in new courses and curricula.

The MARSK project identified the factors that affect emerging skills needs, the demand for skills, and also the supply of skills. These factors become the core of the methodology:

Factors affecting demand:

- Likely technological advances in materials, products and manufacturing
- Changing regulations
- Macro economic trends
- Business practice

Factors effecting supply:

- Demographic and social factors
- Micro economic trends
- Educational trends and policy
- Provision of training and education

[2] The MARSK project, "An analysis of the competitiveness and future technical skill needs of the European maritime industries" was funded by the European Commission under the Leonardo da Vinci Programme (1996 – 1999)

1.2.1. Research Phases

The work phases for the research were as follows:

- Literature review
- Situation analysis
- Identification of issues
- Identification of factors of change through demand and supply
- Analysis and scenario modelling
- Present findings

The literature review showed that there has been no significant research, other than a small pilot study (Paterson et al. 2001) by the BMIF into skills problems in the industry.

The situation analysis was carried out by conducting a series of interviews with employers, representative bodies and training and education providers. Initial contact was first of all made through a network of actors that was built during the course of the research; secondly, a set of employers were identified using BMIF membership listings, as well as the knowledge of the authors' of the industry. Non BMIF members were identified using various trade directories. Letters were then sent to these companies requesting whether they would be willing to participate in the research by providing some of their time to be interviewed by telephone or face to face. An initial 90 such letters were sent, which resulted in 12 face to face interviews, 2 telephone interviews: 12 of these were with employers.

In particular employers were asked about the type of skills that they require their workers to have, as well as questions concerning their approach to training, business, management, technologies, materials and their thoughts concerning the future.

1.2.2. Geographical limits

The project was limited to employers and companies whose core business was based within the geographical remit of SEEDA. However, on the HE supply side and any examples of good practice, data was gathered on a national basis. See regional map below.

Source: SEEDA web site: available [on-line] www.seeda.co.uk

1.2.3. Sample size

The sample of organisations and individuals contacted and consulted in this work needed to be representative of the supply and demand sides. Therefore higher education bodies, NTOs as well as employers were included in the process.

The following organisations were consulted:

- British Marine Industries Federation (BMIF): a trade organisation that represents 90% of the UK's small craft industry. The BMIF also provides a range of training services to the UK marine industry. It is an Affiliated Body of the Engineering and Marine Training Authority, the National Training Organisation for the marine industry.
- EMTA, (National Training Organisations for Engineering and Manufacture) an NTO, part of whose remit is the shipbuilding and marine engineering sector. EMTA represents the industry's training interests to Government; promotes Government initiatives, including NVQs and SVQs, the New Deal and Investors in People, develops national training models, including Modern Apprenticeships and National Traineeships, promotes engineering careers to young people, encourages and supports lifelong learning, assists companies to access sources of European and national funding for training, and develops occupational standards and products to support training and development.

- An FRP fabrication company employing twenty people.
- Principal lecturer of yacht and power craft design and manufacture at Southampton Institute. The Institute is a major provider of relevant education degree and HND courses.
- A representative sample of five marine yacht and boat builders in the region:

  - A builder of cruising sailing and motor yachts; also offers refit and repair facilities as well as generic FRP fabrication and carpentry services. Employed 80.
  - A production builder of small motor craft and work boats. Employed 27
  - A long established company that concentrated on repair and refit of craft, especially in highly specialised areas. New builds were not main business. Employed 89.
  - Company D – Builder of workboats and private craft, also offered extensive refit and repair facilities. Employed 220
  - Company E – Specialists in building, refitting and repair of large sailing and some motor yachts. Employed 87.
- Two marine electronic retailers and fitters:
  - A retailer and fitter of electrical systems, navigation and communication equipment for small vessels. Employs 6.
  - A specialist in designing and fitting PC based navigation and management systems for yachts.
- Two marine electronic manufactures,
  - One of which was the market leader in small craft navigation and communication equipment. Employed 450
  - Another company that specialised in simulation and also supplying PC based software for electronic navigation. Employed 27.
- Two small marine engineering companies that were later excluded from the study because their products were primarily aimed at the commercial shipping market thus falling outside the terms of reference of this study.

1.2.4. Data collection

A thematic questionnaire was used for each interview, which was then summarised in table format ready for analysis. The factors of change were identified through the literature review as well as being an integral part of the interview process. Finally likely scenarios arising from issues identified in the situation analysis were considered as part of the analytical process.

All companies in this report, except for Jago Developments Ltd, have remained anonymous.

1.2.5. Weaknesses and strengths of approach

This work can only be considered as a pilot study. The sample of employers used for the research needed to be larger to ensure a more reliable result. The broad qualitative approach used depended upon secondary data for certain aspects of the problem, such as the gap in demand and supply for instance. More comprehensive and reliable data would be needed to base any initiative or policy upon.

On the other hand, the approach used was useful for highlighting the weaknesses in the labour market and for giving consideration to certain issues. For example, a purely quantitative approach would not have highlighted the importance of management skills or changes in skills requirements in the marine electronics sector. Furthermore, this approach acts as a baseline for further studies: it has highlighted issues that require further research.

2. SECTOR DESCRIPTION MARINE TECHNOLOGY

The UK is considered a maritime nation and marine industries are thought to contribute some 3-4% to the GDP (Marine foresight panel, 2000)

Marine Technology covers many areas including shipbuilding, offshore oil industry, environmental issues and biotechnology and is a vital contributor to marine industries. The scope of this study was restricted to Boat building and marine electronics, for reasons given in section one. These sectors are often described as being part of marine leisure industry and sometimes it is often hard to obtain exact definitions of these sectors and their sub divisions. However the importance to the UK economy is evident.

2.1. MARINE EQUIPMENT

The total value for the world marine equipment has been estimated as £9.75 billion. UK production of marine equipment is estimated at £850 million and is expected to rise. UK companies are regarded as world market leaders (Marine foresight panel, 2000). Other estimates give a turn over of £3.1billion in marine equipment and materials (Pugh and Skinner, 1996). In 2000 the BMIF estimated that the manufacture of marine equipment to be worth £152.7 million (10.2% of the UK marine leisure industry), with marine electronics worth £110.5 million (7.4%)(BMIF, 2000)

2.2. MARINE LEISURE

The world leisure boat industry is estimated to be worth £6.4 billion, of which the UK share is seen to be £620 million. UK is seen as being a very major contributor with a high proportion of production going to export. (Marine foresight Panel, 2000) the purchase of leisure craft is very sensitive to economic factors however after the recession in the 1990's, the UK industry showed a growth in 1993 and 1994. In 1996 there were an estimated 200 companies in the UK. These were predominately small companies building and repairing boats up to 60 m long (Pugh and Skinner, 1996). Interestingly the estimates of turn over in 1996 £510 million on boat building with a further £71 million on engines and £626

million on equipment (Pugh and Skinner, 1996) In 2000, the BMIF put UK boat building as worth £574.5 million some 38.5% of the marine leisure market (BMIF, 2001)

The BMIF estimate that of the total leisure revenue, the South East of England accounts for £664. million, that is, some 44.4% of the total for the UK (BMIF, 2000).

Opportunities for the sector include many growth markets, low volume, high value, high tech situations and technology development and ownership. Specifically for marine equipment, there are thought to be future opportunities in areas of marine electronics and integrated propulsion systems. The leisure boat-building sector is seen as having opportunities to develop on its current market strength and in the production of 24 m plus yachts

General threats to the sector are seen as cost of manufacturing, personnel recruitment and retention, sector cyclicality and different UK regional policies (*sic*), specifically integrated systems supply is seen as a threat to the maritime equipment sector. Skills shortages are thought to prevent growth (Marine foresight Panel, 2000) through limiting the abilities of manufacturers to increase their productivity. Put more simply, without sufficient numbers of highly skilled craft workers, the sector will be unable to build upon its successes; it may also be in danger of shrinking.

UK marine industries are estimated as employing some 423,000 people. In 2000, it was estimated that 24,021 people were employed in the marine Leisure industry directly with some 8,834 (36.8%) in the South East of England (BMIF, 2000). Education and training, in all marine technology, areas are important to vitality of the sector. The diversity and quality of marine science and technology education and training in the UK is regarded as excellent However, some areas are not well served and increasingly a multidisciplinary approach is required (IACMST, 1998).

Summary of trading activities 2000			
	Boat building	**Electronics manufacture**	**South East**
Revenue	£574.5m	£110.5m	£664m
UK exports	£435.9m		
Employment	8181	1300	8834

Source: BMIF, UK Leisure Marine: Industry bulletin 2001

2.2.1. Boat building: description

The builders of small craft building in the region are centred in and around the Solent area. The reasons for this are historic. The use of small craft for leisure purposes, especially sailing and racing is linked to activities of private yachtsmen in the Solent during the 19th century. The area is still a major centre in the UK for leisure boating activities. It is placed within a few hours of London and also provides a wide area of relatively sheltered sea and various harbours, marinas and moorings. Consequently an industry has located itself close to this customer base.

The roots of the modern industry lie with the small, traditional wooden boat builders that were once prevalent. The development of GRP in the 1960s meant that the cost of building a boat was reduced and thus they became affordable to more people. Wooden boat building has since declined.

Although some builders in the area had beginnings as part of larger commercial operations, suppliers to the Royal Navy or other shipping, most have grown out of lifestyle cottage industries[3]. Many of the firms in the area are owned and run by a single person or a small partnership. It was found in the sample for this study that such builders employed between 50 – 100 people.

For the leisure boat market, there are three broad types of production: specialist bespoke builders that produce one off designs or a limited series of vessels; production builders that construct a range of vessels with very limited variation using production line techniques; and finally semi-production builders, who build vessels from a standard range but to order, the standard design is often deviated from depending upon their customer's requirements and consequently the costs are higher.

The majority of the builders in the southeast fall into the semi-production category. They build boats to order from standard designs, but the quality, amount of personalisation and cost is generally higher than that of a production built boat. Of the companies that participated in this research, one was a production boat builder of small motorboats and dinghies; all but two of the builders moulded their own hulls and decks. Also, all of the respondents offered repair and refit services. For one company in particular, this represented a major part of their business. The skills needed for refit and repair, however, are similar to that needed for specialist construction.

[3] Very small firms which are typically established by an enthusiast for the product or service produced.

2.2.2. Marine electronics: description

This sector has grown rapidly in the last 20 years or so. The development and availability of microprocessors and mass production techniques have meant that many electronic navigation products that would at one time have only been found on commercial vessels became affordable to leisure boat users.

There has been growth in two areas: design and production of specialist electronics such as auto pilots, radar, position fixing systems (e.g. GPS, Loran), depth sounding equipment, radios and sailing instrumentation; the other area is further down the supply line, the retail, fitting and repair of equipment.

Designers and producers tend to be large companies who employ several hundred workers at various levels. The products of some companies in the region are manufactured by a third party, but these are not in the mainstream of the market. Retailers and fitters are invariably small firms who employ a handful of engineers.

3. RESULTS OF SITUATION ANALYSIS

This section reviews the main findings of the research. It begins by reviewing the employment structure that was found in the boat building industry. It also reviews the types of background and training that employers prefer for different roles. This section then highlights issues that have arisen during the course of research that are likely to effect skills needs in the future. This section also contains a similar analysis of the marine electronics industry in the region.

3.1. BOAT BUILDING

3.1.1. Current employment

The typical staff make-up of a boat builder employing 50 – 200 employees is described below. An owner or partner managed all but one of the companies contacted during the course of this research. The workforce is then made up of designers, production, supervisors and project managers, craftsmen and technicians.

Skilled craft workers account for ~75% - 80% of the workforce in our sample. In the sample of the companies interviewed the vast majority of workers employed in managerial and craft posts by those companies were white, middle aged males. However the majority of those employed in administrative capacities were female.

3.1.1.1. Managers

All but one of the companies that were involved with the data collection for this report were owned and run by either a single person or by a small partnership. One firm whose main business was producing workboats was owned by a much larger parent company. Most of the respondents held diplomas or degrees in boat production management, boat technology or design related subjects. However, all had completed their study as mature students, who had already had practical experience in the industry.

3.1.1.2. Designers

All boat builders had a small in-house design team. Design skills are normally considered “higher skills”. However, all but one of the

respondents preferred their designers to have craft backgrounds. More complicated work, such as designing new vessels, was usually contracted out to an independent yacht designer or naval architect. This was normally because the number of new designs introduced by a builder were infrequent and would not justify the costs of retaining a full-time highly skilled designer.

Although in this sample, respondents did not report a problem with the recruitment of designers, a national pilot study by the BMIF on manpower in the leisure boatbuilding sector (Paterson *et al.*, 2001) suggested that at the time there were ~55 vacancies for designers that employers found difficult to fill.

3.1.1.3. Supervisors

With regards to line, production, quality control and project managers, nearly all have progressed through the craft route. These roles have become more significant in recent times as products have become more complex and higher demands have been made by customers in terms of quality and in some cases alteration and deviation from the standard design.

It was found that education and training concerning project management tools, production methods etc have originated from attendance at generic ad-hoc courses supplied by industrial training companies, and learning by doing “on the job”.

3.1.1.4. Craft

Craft workers and technicians predominate in their importance to the competitiveness of the industry. This sector is distinctive from most other industries in its high reliance on people with well developed manual skills, for example, laminating, boat fitting, boat repairs, electrical engineering, mechanical engineering and furniture making. The possession of these skills has traditionally been the preserve of people in clearly defined technical occupations, and in the various craft ‘trades’ for which boatbuilding is well known.

3.1.2. Demand for graduates

From the sample of boat builders in this survey, there appeared to be very little demand for new graduates from universities from the industry

on the technical side. Emphasis was always placed upon the employment of those with practical, hands-on ability and experience, especially for jobs that involved soft skills such as project management and quality control.

Respondents reported that they generally received many applications from new graduates either for a specific job or speculatively. However, it was found that the need for their talents was low. Employers in the sample found that graduates have little practical experience of industry, if any; they had high aspirations which were far above their practical abilities and knowledge; and they were receiving fewer applicants from mature students who may have the necessary experience. Employers also expressed fears that line managers who were not former craftsmen would be unacceptable to the workers that they would supervise.

Moreover, some respondents said that they did not have the necessary resources to provide the 'hand-holding' for the period of time that it would take for graduates to become more experienced. One employer stated that he had a graduate working in his design office but he was paid less than many of the craftsmen.

3.1.1.1. Links with higher education

None of the small companies in the sample had any formal links with higher education institutions. One company, that specialised in construction of work boats and small vessels for military use had recently sent a cohort of workers on a specialist composites course at Southampton Institute. Some managers from companies in the region, including several from the south west region, sit on an industrial liaison panel at the Institute to advice on curricula content of courses on yacht design and manufacture.

3.1.3. Training and qualifications

Besides the ad-hoc training bought in from private providers or from equipment and material providers, the boat builders in the sample depended upon several local FE colleges[4] to provide the academic input for their modern apprenticeship schemes. Although some companies reported that they used a local private training supplier, ultimately the private supplier used a local FE college.

[4] Southampton City College Maritime Technology Centre is the main provider in south Hants.

The qualifications possessed by craft and technical workers were either City and Guilds or NVQs (level 2 and 3). The BMIF skills pilot study (Paterson *et al.* 2001) found that employers preferred their workers to possess NVQs in preference to the older City and Guilds qualification.

3.2. CURRENT ISSUES

3.2.1. Severe shortage of technicians and craft workers

There was deep concern by most respondents in the survey regarding the future recruitment of technical craftsmen, i.e. engineers and electricians and also of craft workers, especially skilled laminators, shipwrights and carpenters. Most respondents cited this problem as a major factor in the competitiveness of their companies and the biggest threat to their future. The bi-annual BMIF report "UK Marine Industry Trends, May 2001" (BMIF, 2001) stated that one in four members cited a shortage of skilled labour as an obstacle to increased production. The BMIF workforce pilot study (Paterson *et al.* 2001) estimated that demand for craft workers exceeded supply by ~400 nationally.

This was confirmed by the research for this report. It indicated that the problem seems particularly acute in the Solent region. Every respondent in the survey had experienced difficulty recruiting these types of workers. One respondent stated that he had one electrical and one mechanical engineer working for him at the time: that it had been a struggle to recruit them and was not optimistic about his chances of finding replacements if either of them chose to leave.

Employers in the region are attempting to cope with the situation through recruiting experienced workers from similar neighbouring companies. The inducement for workers to transfer was usually an increased rate of pay. This poaching of craft workers has now become rife in the region. It has consequently caused salary inflation.

There was some evidence to suggest that there was leakage out of the industry of skilled laminators and electricians especially. It was reported by some respondents that laminators had left their employ to work in the automotive or aerospace industries. There was little evidence to suggest that there was leakage into the boat building industry from elsewhere. On the other hand it seemed that most of the worker mobility was still within the industry itself. There has been no quantitative research into this problem.

3.2.2. Problems with the Modern Apprenticeship scheme.

All of the respondents in the survey realised that training of novice craft and technical workers was important to the future of the industry. All had participated in the Modern Apprenticeship (MA) scheme. However, none reported that, for them the scheme was working. Although recruiting young people onto their scheme did not seem to be a problem, maintaining numbers during their course of training seemed to be difficult. Employers in the survey reported MA attrition rates of anywhere between 50% and 100%.

Moreover, employers complained that apprentices lacked motivation to work and discipline. They often found that trainees left the scheme to work in other un-skilled service sector jobs, which are, for the short term, better paid. Employers also complained about the bureaucracy involved, the assessment procedures, apprentice's lack of depth of knowledge and the apparent lack of control over trainees whilst at college or otherwise. Furthermore, respondents complained that course contents are often abstract compared to the real needs of the industry.

3.3. MARINE ELECTRONICS

Initially the research for this report aimed at concentrating of the manufacture and design of marine electronic systems. However, changes in the types of technology used by manufacturers will also impact upon those people and companies that supply, fit and repair systems.

3.3.1. Retailers and fitters

The companies interviewed for this study that can be categorised into this sub-sector were small in size. All run by an owner manager who employed 4 – 6 engineers or technicians.

Technicians appeared to come from different backgrounds. They need to have a knowledge of the equipment they deal with as well as a wider appreciation of electrical engineering. There are no existing qualifications for engineers or fitters. One company who specialised in fitting PCs to yachts as navigation and management centres, had had several employees study for Masters degree in software engineering subjects.

The lack of recognised qualifications made recruitment difficult, especially in an expanding market. It meant that the process tended to rely on word of mouth or sometimes advertising when that failed. Interest in the products and good generic computer skills combined with practical hands on experience was cited as ideal facets for a new recruit. Once again the smaller companies found that graduates lacked practical hands on experience; so much so that one firm in the study would not recruit a new graduate unless they were educated in France. The reason given for this was that French graduates had been given more practical training. Some of these issues are explored further in section 6.3 of this report (Case Studies).

3.3.2. Manufacturers and designers

In manufacturing and design there is more reliance on white-collar staff. Employment in managerial, administrative, sales and other non-manual occupations is still high in absolute terms within the sector and is of considerable strategic importance to the companies.

These tended to be larger companies where recruitment processes were more formal. There was a reliance on recruiting electronic engineers, software engineers, mechanical engineers and also technicians. There seemed to be more opportunities for graduates in these larger organisations. One company interviewed preferred graduates because they came without pre-conceptions and they could be trained the way the company liked to operate.

Not all of these types of companies manufacture or design products themselves, however. One of the UK market leaders in sector, who was included in the survey for this work, did however design and manufacture most of its range from their Hampshire headquarters. For another company in this study the software development for systems was carried out in another state, but the product development and sales were rooted in the region.

3.3.3. Current issues

Compared with the boat building sector there were comparatively few issues for these companies other than those which face other sectors, such as construction and advanced manufacturing for example[5]. Both of the sub sectors however, had experienced problems recruiting new staff.

[5] See "Nurturing Skills in Advanced Manufacturing" , South East Consensus on Analytical Needs for Skills (SCANS) available [on-line] www.skills-insight.org.uk. See

Retailers and fitters found it difficult to find people with the right blend of experience and knowledge. This was further compounded by the lack of recognised qualifications or training courses.

Manufactures also had experienced problems recruiting engineers and technicians. Until recently, many employers had relied on recruiting former merchant and Royal Navy officers into these types of job. This supply has diminished for several reasons, such the introduction of new communications technologies on ships, making the role of radio officer redundant, and the relative decline in manpower of the Navy since the end of the cold war in the 1980s.

also "Study of UK Marine Equipment Industry and its Competitiveness" (1996) Dti, London and also Holt, R., Harris, F., Blake, N., Chabord E., Murray, S., & Trueman, B., (2001) *An Assessment of Skill Needs in Construction and Related Industries*, Business Strategies Ltd, London.

4. MANAGEMENT AND COMPUTING ISSUES

This section analyses the style and importance of the management of companies that were interviewed for this report. It highlights some issues of concern for the competitiveness of the industry in the region, especially those issues that relate to the employment and skills problems discussed in earlier sections. It also contrasts the management styles of marine electronics companies, both large and small.

The importance of generic computing skills for the future within the sector is also discussed.

4.1. BOAT BUILDER MANAGEMENT ISSUES

Evidence drawn from the interviews for this study also demonstrated a gap in terms of management skills. A skills gap exists between knowledge and know-how on the one hand and a skills shortage of skilled craft workers and technicians on the other. For example the interviews showed a skills shortage in the area of theoretical knowledge, particularly regarding stress calculations, and material composites more generally. It is also a possibility that in fact there are skill shortages in the management of these companies. The research has also shown that a gap exists in the area of management skills, particularly regarding customer service and worker retention.

Management views concerning employment appear to be rigid and narrow, typically relationships with their work force seem polarised; whilst poaching is rife, there appears to be little effort made to retain people in ways which are not financial. Although most respondents thought that the MA scheme was not working for them, none had considered alternatives.

They see their current skills problems as quantitative: i.e. they would like to see the numbers of trainees increasing. However no respondent in the survey was developing a strategy to help solve the skills problem either through raising recruitment levels or decreasing attrition rates. There seemed a reluctance to increase training and skills uptake because of fears of loosing well-trained staff. An increase in employment of women as craft workers was a non-issue for many. In the BMIF pilot survey, (Paterson *et al.* 2001) only 11% of employers who responded stated that they would consider employing women in craft roles. Communication and co-operation between employers, FE colleges, NTOs, higher

education institutes and each other seemed parlous. Employers appeared happy to complain, but felt powerless to intervene.

Views on new methods, techniques, business processes and materials seem outdated and cynical, effort seems to be directed to sales and the completion and finishing of products. Owner managers were reluctant to employ graduates in their companies, citing the fact that they were not immediately useful and would prefer to employ supervisors, project managers etc with craft backgrounds. Focus was nearly always upon these key skills.

There was a lack of knowledge concerning social trends in education and training. All respondents regarded the qualification of degree as being somewhat esoteric. However, trends in rising HE participation would suggest that for many young people, a degree is considered a fundamental part of their education. It is no longer considered specialised and available to a small minority of intelligentsia, but typical. Employers complained on one hand about the educational quality of some of those who were on their MA schemes: on the other hand there was little understanding of the dynamics of the education system. That is, an understanding of the possible courses for the shortage of good technicians and craftsmen.

Research by the BMIF showed that many UK boat builders also lacked key marketing and sales skills. The research, "BMIF Consumer Survey and Mystery Shopping Research (2000)" found that staff and managers failed to follow up sales leads and record potential customers' details. On an anecdotal level, whilst researching key skill needs for a European Commission funded project in 1997 (Tarver and Addison, 1997) the marketing manager for a well known Southampton based yacht builder was interviewed by one of the authors of this report. He had had no previous marketing experience before taking on his then current role; he had no marketing qualifications. His previous employment was as an army officer.

4.1.1. Are these traits typical?

Although no research has been carried specifically for the region, work conducted on the management of small companies in the UK and also in the USA shows that the attitudes, behaviour and outlook of owner managers in the boat building industry are nothing unusual. The description of a small company owner manager by Bolton (1971) appears to typify those that were found in this study. The Bolton (*ibid.*) report distinguished owner managers from managers in larger firms on the

criterion of independence and personal gratification. The report emphasised the personal satisfactions of running a small firm: control, contact with customers, development of own ideas, feelings of challenge and achievement – these psychological satisfactions were cited as being more powerful than financial reward. Many of the owner managers (and staff) interviewed for this study were also boating enthusiasts. Feelings of gratification connected with a product they are enthusiastic about are likely to be heightened. It is likely then that the owner manager of a small marine company is motivated by the product, independence and control. This view helps our understanding of the attitudes towards various issues found during the research phase of this study.

4.1.1.1. Recruitment

Work carried out by Scott et al. (1990) sheds some light on why small firms seem to be affected by recruitment problems more than larger ones. They argue that these problems occur because of not only tight labour market conditions but also because small companies always try to look for the right person for a given job and are determined to avoid 'the troublemaker'. This, they argue, reflects the dominant managerial style found in small firms.

4.1.1.2. Employment of graduates

Only three respondents in the survey stated that they would employ new graduates in their companies, especially in technical and management roles. Other stated that graduates had little or no practical experience and that they were not immediately useful. Some stated that they did not have the necessary resources to provide graduates with that experience. None however, had any knowledge of schemes such as Graduate Apprenticeship or Teaching Company Scheme where funding could be found for this type of training. There may be underlying reasons why such companies, especially those larger firms that would benefit from the employment of graduates in the long term, seemed reluctant to employ graduates. Research suggests that owner managers (Stanworth and Grey, 1991 p.213) see other professionals in their sector as a threat, either external or internal to their company. Owner managers see the delegation of responsibilities to newcomers as a loss of control and fear that they may leave, after gaining experience to work in competition.

4.1.1.3. Poaching

The reported shortage of craft workers and anecdotal evidence concerning poaching are strong indicators of a tight labour market. This situation is probably made worse by the geographic cluster of companies in the Solent area: workers are therefore within commuting distance of several employers. A higher turnover of skilled staff compared to larger companies is inevitable. Career progression is generally only feasible by changing employers as small firms generally lack the internal careers structures of larger companies (Storey, 1994 p.191). This lack of career structure therefore increases the chances of poaching and staff turnover.

Furthermore, poaching is further exacerbated by the attitude of employers; in some ways they have become victims of their own success. As discussed before, owner managers prefer to employ the 'right person', and also a person who can be immediately useful to them. They view the MA scheme as failing to supply enough skilled labour, new blood. Expansion of markets in recent years has meant that many have had to concentrate on producing products. Work by Hendry *et al.* (1991) shows that in periods of rapid growth, small firms always concentrate on getting their goods out of the door instead of dealing with training and manpower issues on the grounds that it is seen as diverting activity away from production issues.

For the smaller firms in the area, there was a strong focus on the craft skills. Examples discussed above concerning the preferred prerequisites of supervisors, designers and project managers demonstrate this. This factor, combined with the owner managers' natural enthusiasm for the product has meant that many companies operate within a 'craft paradigm', where the emphasis is on product manufacture and the acceptability of a person based upon their standing as a skilled worker. This factor further limits the opportunities of graduates to work in the industry without practical skills

It would not be unreasonable to state therefore, that because of the craft paradigm that exists in the industry, many owner managers are boat builders running businesses, not businessmen running boat yards.

4.2. MARINE ELECTRONICS: MANAGEMENT

The electronics sector can be split into two: firstly, small companies that supply and fit equipment; secondly, larger companies that design and manufacture equipment.

The management styles of these small companies that were interviewed for this research shared many, but not all the traits of the boat builders. However, all of he firms that were interviewed had all enjoyed rapid expansion rates of between 30% to 50% annually. These owner managers were open to the idea of employing graduates, although one thought that new graduates lacked practical, hands on skills. The labour market for engineers was still tight, but there was no evidence of poaching workers from each other: there was more leakage into marine electronic fitting than boat building. This was mainly caused by people's enthusiasm for the products and also for boats, especially sailing.

The shortage of engineers was also being tackled on a strategic basis nationally. This training initiative by the British Marine Electronics Association is discussed in more detail in Section Five.

One large marine electronics manufacturer was interviewed, there are several based in the UK; this company is the current market leader. They have also benefited from increasing sales and also market share in the last few years.

Many of their managers had received management training whilst a USA based firm owned the company. Since the parent company had sold the UK operation to a management buy-out, this training had stopped. However, the recruitment of some key managers from different industries, such as automotive, have meant that the company has changed.

They have adopted lean manufacturing techniques on their factory floor to increase production. Quality control had been a problem in the past. Their reaction to this was to introduce quality circles to involve production staff more closely. At the time of interview, they were planning new internal training procedures for management and sales staff. Their human resource management policy overall is aimed at retaining workers. Although they admit that their pay scales are not as competitive as other non-marine electronics companies, they make efforts to ensure that workers feel valued; that they were included in decision-making and that the company provided an internal career structure. These are vital factors in retaining staff without causing wage inflation.

To conclude there was a stark contrast between the management styles of this company and that of small firms, especially boat builders.

4.2.1. The future

Research commissioned by the DfEE (Winterton *et al.* 2000) on future management skills in UK industries found that external influences on organisations will impact upon the skills needs of managers. Market deregulation, globalisation, aging workforces and growing female participation will impact upon management skills in the following areas:

- Better group orientated leadership styles to establish trust and collaboration in employment relationships.
- Better global awareness; managers will also need to be more knowledge based concerning new markets, competition etc.
- Skills to manage change, flexibility and promote learning and innovation.
- Better people management skills

4.3. GENERIC COMPUTING SKILLS

At the start of this research project it was thought that computing skills may be an issue and also an important factor in skills needs for the future.

However, it was found that the impact of computing was not so great upon the industry as thought. Although the computing skills of specialists such as designers will increase, and that there will be an increasing need for software specialists in the electronics industry, the need for upskilling across the board for generic computing skills was found to be low; none of the respondents thought that it was an issue.

4.4. CONCLUSION

It was interesting to mark the contrast in management styles between small marine companies and just one larger company (450 employees). Although, given the literature on small firms this should not have been so surprising. It is also interesting to note that whilst all of these companies are members of the same trade organisations (BMIF) and that they are interlocked with in a client / supplier relationships that there is little

sharing of good or bad practice between them; there is no conduit for this. Surely it is on the interests of suppliers to make sure that the UK's boatbuilding industry remains healthy?

Moreover, research (Winterton *et al.* 2000) into future skills needs of business managers shows that there is a possible lacuna developing between the contemporary management skills found, and those anticipated.

5. FACTORS AFFECTING SUPPLY AND DEMAND OF CRAFT SKILLS

This section reviews the factors that will affect the skills requirements for the future. As discussed in section one of this report, a review of these types of factors is an essential part of the methodology for forecasting emerging skills needs and barriers to future competitiveness. This methodology acknowledges that workforce skills are affected by demand factors: that is what employers require; and then by supply factors, that is, what numbers of people will be available in a given time frame and the types of qualifications and knowledge they are likely to bring with them.

5.1. FACTORS AFFECTING DEMAND

This section reviews the external and internal factors that are likely to effect skills needs in the next 5 to 7 years.

5.1.1. Technology trends

5.1.1.1. Boat building

The standard materials used by boat builders for hull moulding are polyester resin and chopped glass strand matting (CSM). These materials are laid into a female mould by hand or sprayed. New materials that have been developed in recent years make it possible for builders to make laminates stronger, lighter and thinner. These new types of resins include vinyl ester and epoxy; fill materials include kevlar and carbon fibre. Other new techniques have been developed for the manufacturing process, such as the use of pre-pregnated matting and vacuum bagging for example.

The use of advanced materials, such as FRP was found to be minimal. The costs of hull, deck and internal mouldings are significant in the overall cost of a finished boat. The application of such new materials and techniques has to therefore add considerable benefit to the finished product as they are more expensive than the older polyester / CSM combination. There is little added value in ratio to cost to boats that are used for leisure purposes. There is a small market for specialist craft, for example, racing yachts, racing power craft and military applications, but it must be emphasised that in the southeast, these types of applications represent a small and specialist market. Therefore, the application of this form of technology offers little added value to the majority of boats

offered on the market by the region's boat builders. Therefore the pace of technological change in materials is likely to be slow in the region for the majority of employers. For some employers, especially specialist builders, this is an important area, but the overall impact on the industry will be low. It will remain so until new materials or a system of moulding has been developed that offers more benefits to ratio of costs.

What has changed in recent years, and will probably continue to do so is the size and complexity of yachts. The average size of a new yacht has increased. Customers expect hotel and navigation systems to be pre-fitted during the production process and to be integrated into the vessel. Customers also expect a higher level of finish and in some cases more personalisation than previously encountered.

5.1.1.2. Electronics

The marine electronics business is relatively new when compared to boat building. The availability of the microchip and mass manufacturing techniques have meant that the size and relative price of equipment that was once only found on commercial vessels was available to leisure craft owners. Until the 1990s typically owners fit much electronic equipment to boats post-build. It is more usual now to have navigation system integrated into the design and manufacturing process of the vessel.

The equipment that was aimed at the leisure market was typically made up of dedicated units with a single function; an electronic language (NMEA) was developed that allowed units to interact. In terms of design and manufacture, units were made from non-generic major components. There was much emphasis on the electronic design of circuits etc. There is a gradual move away from this dedicated approach. It is becoming increasingly common for manufacturers to use generic components and boards in new products. This has placed the emphasis on new product development on software rather than on hardware.

For the future the development of the on-board computer for small leisure craft will become a reality. Currently, in the leisure market the more traditional stand-alone equipment still has the market share. However, during the past few years, commercial vessels and racing yachts have begun using PC based navigation systems on an increasing scale. One company interviewed for this study, which designs and installs such systems into yachts, has been expanding by 30% over the last few years. The development of the on-board computer using generic components will put increasing emphasis on software skills for repair, updating, fitting and design. The need for knowledge of dedicated

electronic components will of course diminish as these systems can be constructed from generic computer parts.

5.1.2. Regulatory

The boat-building sector is more likely to be effected by regulation in the future. There is growing pressure on boat manufactures from national and European regulation on safety and environmental matters. The European Small Craft directive has meant that builders have had to demonstrate stability; regulations on liquid petroleum gas fitting and appliance installation. Further regulation will effect engine noise and gas emissions.

More relevant to this study are new environmental and health and safety regulations concerning styrene[6] emissions. Manufacturing processes may have to change in order to comply. Some resin manufactures are developing low styrene resins, however it is uncertain at the moment how this will impact upon the industry.

5.1.3. Economic

The labour requirements of boat builders are obviously dependent upon the sale of their products. Growth in the sector has been considerable in the last few years (see Table below) averaging ~10% per annum. Whilst manufacturing in general has reported negative growth in recent times[7], the boat-building sector has bucked this trend with a consequent increase in labour demand. On the other hand, a drop in orders could result in a consequent reduction in labour demand. However, there is no available research and data on the impacts of the economy on this labour market.

Table 1.1 Total Industry revenue 1995 - 1999
£ Millions

	1995	1996	1997	1998	1999	2000
	977	**1,088**	**1,289**	**1,265**	**1,341**	**1,494**
% inc. on previous year		11.3%	18.5%	-1.8%	6.0%	11.4%

source: BMIF January 2001

In general however, forecasts indicate that growth will continue, but in the short term at a slower pace. The latest survey carried out by the

[6] Styrene is the solvent used in resins
[7] See Tily (2001) "Economic Update – July 2001", in Economic Trends: Office of National Statistics, London

BMIF[8] of their members indicates that the majority of employers in the sector are still optimistic about the future and that the market is still strong. Sector growth in 2002 is expected to be around 5%.

The industry has been affected in the past by economic slow down; it was especially felt in the late 1980s. However, whether the effects of the world economic slow down that is being widely reported at the time of writing will impact upon the sales of UK built boats is something that requires consideration, yet cannot be fully answered here: a detailed and in-depth answer to this would need to be the subject of further study.

It is possible, however, to highlight the differences between the situation in the late 1980s and now. It is to be remembered that the region's boat builders' products are sold mainly to individuals, not corporate bodies: the UK domestic economy still appears to be strong. Interest rates are low, inflation is low, the housing market is still buoyant and unemployment is at its lowest level since 1975. Forecasts for 2002 (Tily, 2001, p.7 "HM Treasury's 'Forecasts for the UK economy') show that unemployment nationally is expected to rise slightly, whilst economic growth starts to increase again, although these have needed revision after the International events in September this year. Growth in the UK economy is forecast (Business Strategies, 2001) to make a recovery a year later in 2003 with consequent rising employment levels.

Employment, interest rates and inflation October 2001

Interest rate (Sep)	4.5%	**Halifax house prices (Sep)**	Up 8.3% on 2000, but unchanged to August
Underlying inflation	2.3%	**Unemployment (ILO) (Aug)**	5.1%, down from 5.3% in 2000
Headline inflation	1.7%	**Claimant unemployment**	3.1%, down from 3.5% in 2000

Source: HM Treasury Economic Bulletin October 2001[9]

As far as exports are concerned, forecasts and current trends are mixed and also uncertain. It is widely reported that economists expect the world economy to experience a slow-down, rather than a recession, as the current trends appear to be driven in the main by a lack of confidence in the new technology and communications markets. Of the industry's markets, the USA economy seems to be most effected: currently growth is low and unemployment is rising. In EU countries however the outlook is not so gloomy. German and French economic growth has slowed, especially in Germany; , however on the other hand, growth in the Italian economy is strong with no signs of a slowdown (Schurich, 2001 p.8).

[8] UK Marine Industry Trends, May 2001. Available [on-line] from www.bmif.co.uk
[9] Available [on-line] www.treasury.gov.uk

According to recent forecasts (Business Strategies, 2001) UK exports should enjoy a significant rise during also during 2003.

Therefore under these conditions it would be reasonable to expect some growth in the market within the time frame of this work for boat builders and marine electronics manufacturers with a consequent effect on employment demand.

5.2. FACTORS AFFECTING SUPPLY

This section discusses and analyses the supply of workers to the industry in terms of the training of skilled manual workers, technicians and also from higher education. It also reviews the trends that affect the supply of skills to the region's employers in order to analyse the outlook for skills needs in the future.

In recent years there has been an increase in the number of employers experiencing shortages of workers, such as the armed forces, service sector, construction and shipping. Lower un-employment, economic growth and demographic reasons have caused a tight labour market. A recent report on recruitment practices in the UK (CIPD, 2001) found that half of employers in their survey had experienced problems recruiting workers, although only 37% of manufacturing companies had reported problems. However, compared to the results from the previous year's survey, the number of manufacturing firms reporting problems had more than doubled. The main reasons for the recruitment difficulties were lack of experience and lack of technical skills.

5.2.1. Demographic factors and trends

As discussed above, the supply of young people into the workplace is an important factor to the boat building industry. The last few decades have seen a decline in the numbers of young people as birth rates have fallen since the 1960s, and also the average age of the population has increased.

Data on the age structure of the south east's workforce shows (Skills Insight, 2001c) that the number of workers over the age of 50 have increased ~75,000 since 1998, whilst the numbers of workers aged 25-34 have decreased by some 37,000. Although there is no data available on the age structure of people in the boat building and marine electronics industries, it would be a strong possibility however, that employers in the sector will be faced in the next ten years with a high number of retirements from their workforce. If this is the case, employers need to consider the recruitment of more trainees to ensure that skills are not lost with retiring workers. Given the present situation in the industry, the question remains, will the conditions be more favourable for them to fill vacancies?

The latest demographic forecasts (Skills Insight[10] 2001) for the region do show an increase in the number of young people at school-leaving age. The numbers of young people aged 15-19 in the region will increase by ~26,000 (4.5%) by 2004. The real numbers could be greater because of in-migration. In certain areas perhaps of more importance to this study, within the unitary boundaries of Portsmouth and Southampton there will be a drop in the numbers of people in this age range. This may be caused through migration out of the unitary boundary, presumably into the Hampshire County area. Rather significantly, on average in the region, 52% of 15 – 19 year old cohort in 2004 will be female.

5.2.2. Economic factors and trends

There are several micro economic factors that affect the supply of skilled labour in the region. First of all the costs of housing can restrict worker mobility into the region. The southeast region, according to Government statistics (National Statistics, 2000 p.100) has the most expensive housing outside of the London area. According to these figures, average home rents in the region are £20 a week more than in the southwest and almost double that of the northeast. According to National Housing Federation data (NHF, 2001), the average house price in Hampshire (County) is £154,000; in West Sussex £148,000; in Southampton it is £93,000; in Portsmouth £91,000. See Annex A for a regional breakdown of housing costs.

Selection of average house price per local authority area: earnings needed to purchase

County or Unitary authority	**House Price**	**Min. earning to buy @95%***
Bristol	109,912	34,805
Bridgend	62,426	19,768
Plymouth	72,832	23,063
Devon	113,650	35,989
Dorset	141,067	44,671
East Sussex	122,096	38,664
Hampshire	154,292	48,859
IOW	99,327	31,454
Kent	128,001	40,534
Norfolk	90,573	28,681
Northumberland	77,623	24,581
Middlesborough	48,148	15,247
Southampton	92,925	29,426
West Sussex	147,767	46,793

[10] Cohort change in young adults by local area, 1999 – 2004. Skills Insight 2001.

*Minimum earnings are calculated from 95% mortgage and household income multiplied by three.
Source: National Housing Federation (2001)

At the time of writing, the housing market in the region is still buoyant. National Housing Federation data (*Ibid.*) shows that since 1970, house prices have risen by 135%, whilst wages by only 60% thus affecting the ability of low paid workers to enter the private housing market. Although it is expected that the market will plateau soon, the region will, however, remain expensive compared to others for the foreseeable future. This will restrict the in-migration of comparatively lower paid workers.

5.2.2.1. Employment

Moreover, the Solent area has a relatively low rate of un-employment. According to Skills Insight data (Skills Insight, 2001) the national rate of unemployment is 3.1% (claimant). In Hampshire, IOW, Portsmouth and Southampton it is only 1.5%; East and West Sussex is 1.8%.

Government forecasts (National Statistics, 2001) predict that employment in the south of the country will continue to rise. Most of the jobs will be created in the professional and service sectors and there will be a decline of about 200,000 jobs nationally in skilled trade occupations. However, this report does point out that losses in skilled trade occupations will be outweighed by opportunities created by retirements and worker mobility. Regional Skills Insight data (Skills Insight, 2001b) shows a forecast 5.2% rise in employment by 2010.

5.2.3. Education and policy

5.2.3.1. Government policy

In the past ten years there has been a move to wider participation in Higher Education in the UK. Participation has risen from 10% some 30 years ago, to 17% in 1989/90 and 33% in the 1998, with a government target of 50%. While the numbers of female and mature students has increased to some 50% of the student population, students from less affluent backgrounds continue to be underrepresented (DFEE, 1998).

For the future, the Government has acknowledged the need to upskill the existing workforce (Healey, 2001). It hopes to increase the numbers of

young people (under 30) benefiting from HE to 50%[11] by 2010. The Government aims to achieve this through promoting the benefits of HE and establishing Foundation Degrees that give credit to practical application and allow students to combine study with work.

Furthermore, the Government is committed to the development of "Lifelong Learning", which is witnessed by the establishment of the *University for Industry* and the establishment of *individual learning accounts.* The government would also like to see business, employees and their trade unions work with education in supporting and developing skills in the workplace. The building of a qualifications system that is easily understood, gives equal value to both academic and vocational learning is also desirable and in some sectors work is progressing to meet these needs (DFEE, 1998).

5.2.3.2. Trends in higher qualifications.

Employers have recognised and valued the intellectual advantages of "traditional" degrees, however they also see the advantages of the more "modern" broad-based degrees. This was reflected in the Dearing report (1997), which favoured programmes offering a broad range of subjects. The report also recommended support for the development of a broad range of key skills to be included in higher education programmes Employers, particularly small and medium sized enterprises expressed a view that work experience for graduates was highly valued as it allowed new graduates to be effective in the work place (Dearing, 1997). In the past few years Higher education institutions have responded to these areas as far as they can. However, in engineering and science subjects, the practical element of courses is severely limited by funding. Although an HE institution receives double the funding for a science or engineering student compared to a business student for example, this does not reflect the true costs of their education if there is a large practical element in the course.

5.2.3.3. Provision of related courses

The 2001 provision for higher education courses in marine technology is listed by University and Colleges Admissions service (UCAS). There are three categories for courses titled marine/maritime:

[11] This includes Foundation Degrees: Introduced this year, these new higher educational qualifications aim to combine technical skills and academic knowledge. Press release DfEE 21st June 2001, available from [on-line] www.dfes.gov.uk

- **Marine -** which covers mainly marine science and geography courses
- **Maritime -** which covers many aspects including maritime business and some technology courses
- **Maritime Technology -**these courses are technological and cover all aspects including yacht construction and design, marine engineering, offshore industry.

Maritime Technology is the most relevant classification of courses for this study and a full list of these courses is to be found in Annex B. Table lists provision in the SE England

65 courses in 13 institutions are listed nationally, with 16 of those courses being provided in the SE region, by two institutions, Southampton Institute and University of Southampton. The sector is very small and some of these courses often struggle to fill. This makes them vulnerable to closure. Nine other courses are provided by two institutions in the SW region, University of Plymouth and Cornwall College.

A further 12 courses are listed as either marine or maritime engineering, none of which are taught in the SE region.

Additionally there will be provision of other engineering courses, e.g. civil, electrical, offshore etc, but with some 3970 courses, 570 in the SE, this is a difficult sector to analyse. The provision is deceptively large as many of these courses may be "engineering with" a language, business etc. The reality is that like the maritime technology these courses are also struggle to recruit (see section 5.2.3.4).

The project identified the need for business education. Some 5489 business courses are listed nationally with 818 in the SE region. Therefore provision of business courses appears adequate for the sector needs.

The numbers quoted do not indicate the difference between full and part-time provision. This may certainly be an issue especially with respect to upskilling the current workforce.

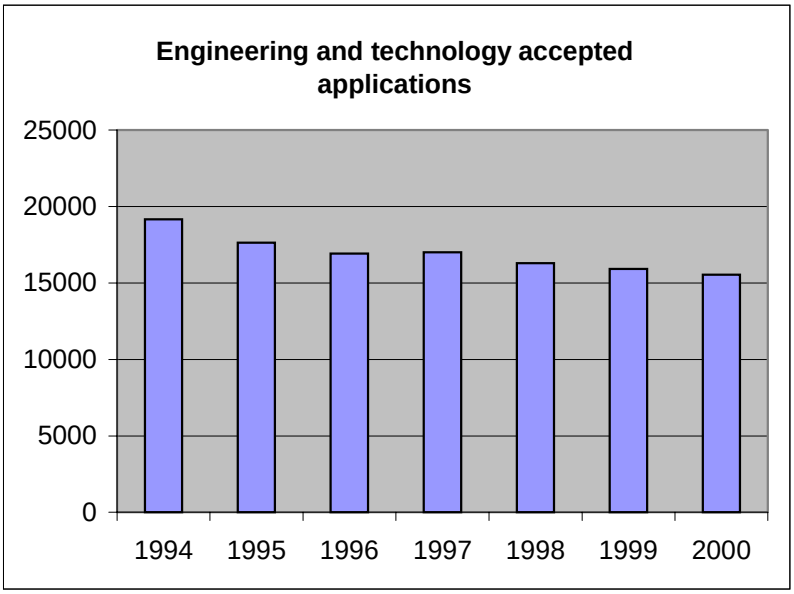
This study has not looked at CPD courses in marine technology, but is aware of two industry/ Higher education initiatives, one in advanced composites and another in hydrographic surveying, both run at Southampton Institute.

5.2.3.4. Supply of graduates

The supply of graduates to the industry can be measured in several ways.

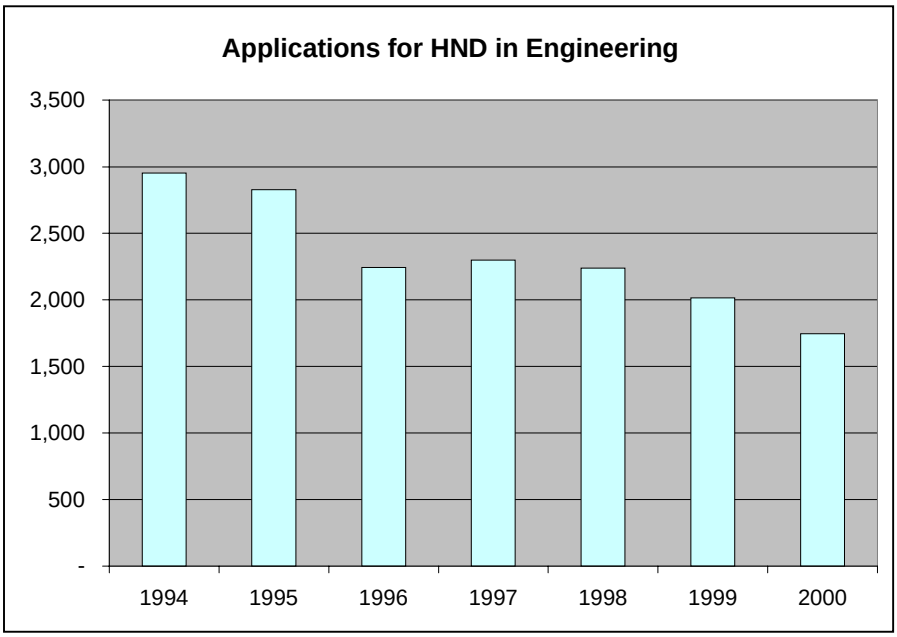
The actual numbers of graduates in a given year can be used, however, for the purposes of this work, it is more important to identify trends, rather than hard numbers. Therefore, to analyse future trends in higher education the applications data from UCAS can be used. Although detailed data for degree courses is not readily available, it is available for engineering courses. Subjects such as yacht design, marine technology, electronics, mechanical engineering, which some parts of the industry depend upon, are included in the category

There has been a steady drop during the last six years in applications for science and engineering courses. Applications for engineering courses have dropped from 19,156 in 1994 to 16,298 in 2000, see graph below. Mechanical engineering has dropped from 3631 in 1994 to 3430 by 2000; electrical engineering from 768 to 97; electronic engineering, from 2953 to 2440. Some subject area have risen slightly, however the overall trend is downward whilst absolute numbers of students entering higher education is increasing. For example, applications for degree courses in business and administration subjects have increased from 22,996 in 1994 to 28,968 in 2000.



Source: UCAS 2001, available [on-line] www.ucas.ac.uk

More alarmingly is the drop in numbers of applications for HNDs in engineering subjects. Over the last 6 years these have almost halved despite an increase of ~20% overall in HND applications.



*Source: UCAS 2001 (*Ibid.*)*

The experiences at Southampton Institute reflect some of these findings. Attendance on HND courses has been in steady decline for a number of years, causing the closure of several. It was felt that students prefer to study for the qualification of degree rather than a diploma. Although some engineering courses have seen a drop in demand, the numbers applying to the BEng. in yacht and power craft design have remained steady.

Furthermore, the outlook for electronics manufacturers does not look too gloomy if they become increasingly dependent upon software expertise. The numbers of applications for places on computing related courses have risen from 8401 in 1994 to 17,880 in 2000.

5.2.3.5. Student destinations

As part of this work, research into destinations of students was started with aim to analyse the numbers of graduates entering the industry. Only first year destination data is available: a too shorter time period to be reliable. Consequently the results from this exercise were inconclusive. However, from the data generated by Southampton Institute careers service, of vocational destinations of graduates, it can be seen that very few people with relevant degrees work for small craft designers or manufacturers in this time period. Given the results of the

research discussed in section three of this report, this is not surprising. A summary of this data is included in Annex C of this report.

5.2.3.6. Future supply of engineering students

Moreover, research indicates that school children generally lack knowledge of the reality of engineering as a profession; only 4% of girls in a study commissioned by EMTA[12] had considered engineering as a career. Most children associated the profession with poor pay, poor image, dirty working conditions and poor opportunities. Therefore the pool of people where traditionally employers in this field have sought trainees has reduced considerably, and it is not likely to increase by a significant amount in the near future. Therefore the current situation will is not likely to improve and could possibly create severe problems for the industry in the future.

5.3. CONCLUSION

- The application of new materials and methods to boatbuilding in the region for the next 5 – 7 years will be limited to specialist applications only. Even in the face of further regulation of styrene emissions, this is likely to remain the case until new methods have been developed that will cost less than normal methods of moulding.
- Skills for craft workers are likely therefore to remain unchanged for this time period. There will be a limited demand for upskilling for the use of advanced composite materials.
- Methods used to train and recruit people as technicians and craft workers for boat building need to be more effective. Unless this problem is addressed, the shortage of these types of skilled workers will become chronic and is likely to damage the industry.
- Given the high attrition rates of apprentices, the forecast increase in participation in higher education of young people, it is unlikely that the rise in the numbers of young people in the region will have much impact upon the problem.
- Supervisory and planning skills are likely to become more important because of customer demands and integration of electrical, plumbing and navigation systems.

[12] Survey commissioned by EMTA, 2001

- In electronics there will be more emphasis on software and PC technology. This will directly impact the skills needs of fitting and repair technicians and engineers.
- Trends in higher education indicate that engineering courses, especially HNDs, are becoming less popular with students. This downturn in numbers will impact upon employers in the sector that employ from this group.
- There is a possibility that employers in the marine electronic manufacturing and design sector may have to rely on recruiting software and hardware engineers in the future who have little knowledge of the sea or navigation.

6. CASE STUDIES AND SCENARIOS

Section Six contains reviews of practice found in the industry that appertain to skills needs and competitiveness. It also contains in greater detail, case studies of companies that took part in this research to illustrate some of the points that were made in earlier sections of this report.

6.1. JAGO DEVELOPMENTS

This Chichester based company established in the 1970s, began by producing fibreglass bodies for cars. Since then it has diversified into becoming a specialist FRP fabricator. Their bespoke products range from FRP doors, shop signs, artwork, promotional sculptures and micro-light wings. Although not a boat builder, much of the work of Jago is comparable to that of vessel moulding.

One of the current partners in the business, and very much a hands on manager, is concerned with the lack of training available for this type of craft and also about its perceived low status. Moreover, he is also very concerned about the high level of poaching of craft workers, especially of his employees.

He believes there is a clear need for a specialist FRP training centre in the region. He has therefore been co-operating with a resin supplier to produce a new course for FRP technicians to NVQ level 3. He has a very innovative approach to running the courses however. He does not intend to train his own workers alone, he also intends to train laminators for other employers also. The planned course will be a combination of theoretical work and also learning by doing. It is the revenue from the products that the supervised trainees produce and course fees that will cover the costs of training. He believes that this type of course, which is held in the domain of industry, is more relevant to its needs and to the trainees. It also has the added benefit that employers will feel in more control of their apprentices.

6.2. MARINE ELECTRONICS: RETAIL AND INSTALLATION

A small company based near Hamble has now been operating several years specialising in the supply, fitting and repair of electrical and electronic navigation equipment. It is not untypical of other companies found around the UK. It has an owner manager and a small team of engineers that operate from their premises.

In recent years their turnover has increased by 50% annually. Their core business is installation of new equipment. They are often sub-contractors to yacht builders and importers in the region to install equipment either post-build in the case of imported yachts, or during the build process. Other types of business include retail and repair of equipment.

They have a small team of six engineers all of whom have various different backgrounds. At one time, the backgrounds of those who were involved with the installation and repair of electronic and specialist electrical equipment for small vessels would have been with the armed forces or possibly the merchant navy. This no longer seems to be the case. The background of the current workforce of engineers includes two people who have HNDs in yacht manufacturing and yard management, a former domestic electrician and a former mechanic from Volvo Penta (marine diesel engines). The commonality between these people, and the reason why they have chosen such a career move was because of their interest in marine electronics and associated leisure activities.

As the company has grown, however, this style of recruitment has failed. They had struggled in the recent past to find another engineer to join their team. Their network of enthusiasts has failed them and they have had to formalise their policy. As an experiment, they have recruited to train a sixteen-year-old school leaver. They believe that recruitment at an earlier age combined with a formalised training process form the basis of a future manpower strategy. However, they have several problems still to overcome:

- There are no recognised standards and qualifications for marine electronic engineers for small craft.
- There are no training courses available that are applicable to their business and match the skills and knowledge that is required.

The owner manager is also prominent in the British Marine Electronics Association (BMEA), a sub-group of the BMIF. They have put together a small budget to start writing a course aimed at trainee engineers for their

sector. This has been done in co-operation with other similar companies, and also manufactures. The course is intended to be run at FE level, however, the BMEA wish to maintain control over the assessment of trainees.

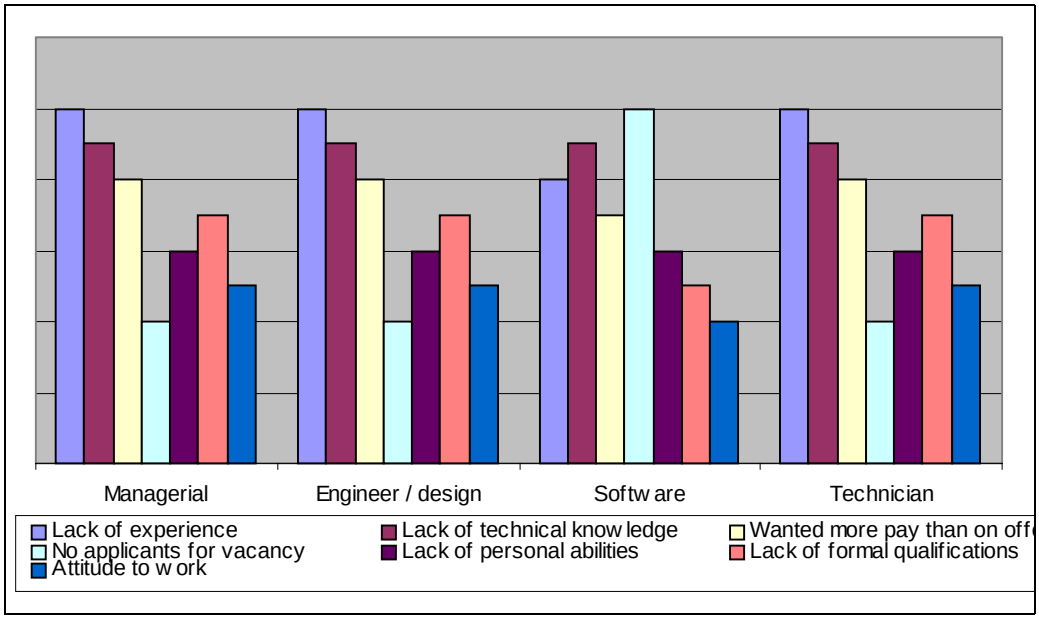
6.3. MARINE ELECTRONICS: MANUFACTURING

This manufacturer of marine electronic navigation instruments, who had participated in this study has expanded its market share in recent years. It designs and manufactures most of its range from their HQ in Hampshire; a small part of their range is made outside of the UK.

They have a high dependence upon management and technical staff. They require management and engineering staff to have a degree in a relevant subject as well as experience; for technician grades they look for a minimum of HND. Many of their existing employees are boating enthusiasts; the company readily admits that they cannot pay the full market rate for salaries when compared to other non-marine sectors. However, they argue that their good retention rates show that their employees' enthusiasm mitigates this.

The research showed that currently they employ 44 managers, 10 electronic engineers (plus 15 self employed engineers), 4 mechanical engineers, 14 designers and ergonomics experts, and 17 technicians. They have, however, experienced difficulties in recruitment.

The main reason for these recruitment problems were a "lack of formal qualifications" for the job, except in the case of software analysts, where no applications were received for advertised vacancies. The company then gave "lack of technical knowledge" followed by "reasons concerning pay" as the other main problems concerning recruitment. A breakdown of this data is given the graph below; barriers to recruitment have been ranked in order against job type, the tallest bar representing the most common reason.



In the light of these experienced this company have had to make changes in their recruitment practices; such as offering candidates more methods of applying for vacancies; speeding up the recruitment process; introduction of bounty payments for staff who recommend applicants; they put effort into retaining existing workers and compete in terms of the salaries and benefits offered to new recruits.

Their strategy for retention of existing staff whilst also maintaining their recruitment standards is commendable. However, they need to consider their future workforce in the light of trends in higher education. Section 5.2.3.4 of this report discussed the drop in applications for degrees and HNDs in engineering subjects, and showed a dramatic rise in the numbers of applications for IT courses. Also, although it would be very difficult to measure, their reliance on enthusiasts for recruits is possibly not a good basis for a manpower strategy in a tight labour market. This company needs to plan for these factors and needs to have a training strategy in place to provide upskilling where needed, either in electronics, mechanics, manufacturing or even "marinisation" if the supply of knowledgeable enthusiasts dwindles.

6.4. SCENARIO MODELLING

It was intended at the onset of this work to carry out some scenario modelling in order to analyse the emerging skill requirements in the industry. Such an approach however, relies upon a great deal of co-operation with employers and to some extent data on workforce profiles. As discussed earlier, the problems facing the industry, especially in terms

of skills, are more fundamental than thought. Therefore this approach has limited value. What is possible however is a more limited exercise analysing the possible solutions to the problem of craftsmen and technicians for boat builders.

6.4.1. Scenario model: strategies for boat builders

During the course of research for this project, owner managers were asked what their strategy would be if the shortage of craftsmen and technicians became chronic, or the costs of labour became prohibitive. Most did not have an answer, however one respondent stated that he would sell up the waterside yard for property development. This is obviously something that needs to be avoided, as it is not in the interests of the region's economy in terms of employment or employment diversity. Moreover, the region's boatbuilders have a network of suppliers who are also largely based in the region.

There are two broad strategies that can be used to avoid this gloomy scenario. First of all a strategy can be developed for a company that acknowledges the lack of highly skilled workers and develops a way forward to enable a firm to produce boats with less skilled workers. The second strategy is one which is aimed at creating a workforce to suit the needs of employers, which is highly skilled, motivated, and productive.

6.4.1.1. Scenario One: skills shortage determines strategy

If a model of a boat yard was taken, that represented a typical boat builder of the region in terms of employment, skills, product etc it would be easy to see that the business depends absolutely on the skills of its craftsmen. In many ways this is what it sells, either for new build yachts, re-fits or repairs: they sell on quality, quality is produced on the skills of craftsmen and to some extent their supervisors.

For this scenario the model builder produces a standard range of boats, built to order for individual customers, a typical semi-production builder. The significance here is that the standard design is often deviated from. Each boat built is individual and not a clone of another. These products therefore require highly skilled people to create them.

For the last few years, this model firm has seen their sales rise steadily as demand for their products has increased. Consequently they have been forced to recruit more craftsmen to fill vacancies created by increased production and those created by internal and external worker mobility.

They have found it increasingly difficult to find good craftsmen. Some younger workers that they have recruited in recent times have had to be supervised more closely; this has been another drain on their manpower resources.

If the builder finds that he can no longer recruit enough craft workers to complete orders, or it creates quality problems, especially on repairs and re-fits, what are his options?

One strategy that an employer may take is to use the labour that is available to dictate the type of product that he produces. Semi-production and bespoke boat building is highly dependent on skilled workers, however, production boat building is not. Production boats can be constructed using modular techniques where skills become less important to the production process. The business becomes 'push' rather than 'pull'; that is, boats are manufactured regardless of whether they have been ordered or not.

The advantages of such a strategy are as follows:

- Overcome craft skills shortage by reducing requirements: can use non-marine specialists with generic skills
- Increase turnover
- Appeal to wider market
- Increased productivity per worker
- Increased production reduces unit cost
- Would create more management and technical jobs

The strategy however is not without its disadvantages:

- Requires capital investment for new designs, tooling, and for enlarged premises.
- Needs strong marketing and sales support to gain requisite market share in a competitive environment
- Also needs strong strategic and financial skills
- Element of financial risk especially if marketing fails

Although this strategy would help the boat builder to overcome the skills problem, it would require a large capital investment. This funding may mean that the owner manager may loose total control over his company. There is also an element of risk, especially cash flow problems if units are un-sold.

The other issue concerning this strategy is premises. Production boat building often requires large premises. Apart from the possible

investment in new buildings, the Solent area where the majority of these builders are situated, is relatively expensive. This factor would put the builder at a competitive disadvantage if he does not move his production to an area where premises represent a lower cost burden. Furthermore, the difference in the costs of labour in the south east region are substantially more than other parts of the UK, such as the south west or Wales for example (National Statistics, 2000 p.85). Successful French production boat builders, for example, manufacture their products inland, whilst their sales and customer service are concentrated on the coast. A Solent based yacht builder has a similar strategy. They have retained their sales, repair and refit centres in the Solent area, but their products are manufactured in Devon.

6.4.1.2. Scenario Two: workforce creation

The employers of course could develop a strategy to overcome the skills problems on one hand and continue their business activities as before. According to researchers on skill shortage problems (Bosworth and Dutton, 1990), the factors that are needed to overcome the problems caused by a tight labour market are concerned with the selection and retention of workers.

On the one hand employers need to concentrate on retaining existing workers. Means of doing so without causing wage inflation are well documented[13]; these must include opportunities for continued development, improved conditions, internal career structures etc. On the other hand employers need to concentrate also on the selection process more than they do now. They need to concentrate on applicants' potential as much as their ability; their personal traits and personality. They need to make sure that new apprentices are enthusiastic, willing to learn and likely to stay the course of their training period if this strategy is taken, an employer should have a more highly skilled, and motivated workforce. Although the selection process may be more expensive, and more time consuming, and training will distract effort away from production, in the long run it forms a strategy to solve a problem that is unlikely to remedy its self. Moreover, it is likely that a higher skilled workforce will be more productive and can work with less supervision.

[13] See for example; Harrison, R., (1993) **Human resource management: issues and strategies**, Wokingham Addison Wesley; Jay, D., (1998). **The essential personnel sourcebook**, London, Pitman; Pearson, S., (1994), **Personnel a practical handbook**, London, Industry Society Press.

6.4.1.3. Discussion

Either scenario above offers a solution to the problem. There is some evidence to suggest that production boat builders are more successful than semi-production. According to Clive Hogan[14] of the BMIF, UK based sailing boat builders, who are largely semi-production builders, have 10% of the domestic market. Conversely, UK based motorboat builders, the two largest of whom are production builders[15], have a 78% share in the domestic market. Although there are other factors that affect this situation.

The production boat scenario, however, involves a much higher element of risk than the second scenario. As discussed in section four of this report, owner managers are motivated by what they do more than by financial gain. Furthermore, the region's boat builders already 'feel' successful; they have a strong foothold in a niche market. These factors would not only make employers more likely to be risk adverse, but also they would loose some of their control of their company. It would therefore seem unlikely that owners would choose this strategy.

The problems with apprentice training would need to be addressed. Control of the process needs to be put back into the hands of employers. Apprentices need to carry out their training in the workplace without periods away from the workplace to attend an FE college. Academic material needs to be delivered in person or by distance learning to the workplace. In this way employers will feel in more control of their apprentices. There is also the benefit that apprentices can spend more time on projects, which are of commercial value rather than for learning purposes alone. This may mitigate the costs of higher wages paid to trainees in order to help retain them.

Currently, continued professional development of technicians and craft workers after NVQ level 3 or equivalent seems to be ad-hoc; there is certainly no accreditation for experienced and highly skilled workers. There is also no accreditation or training available for supervisory staff and line managers. This needs to be addressed in order to offer lifelong learning and to increase motivation to learn. To develop NVQ 4+ and also new Foundation degree based qualifications for craft workers and technicians, there needs to be a better partnership between the industry and higher education institutes.

As part of this strategy employers may also have to accept that the qualifications of their workforce may change radically to existing profiles.

[14] Personal Communication. September 2001
[15] Based in the south west region

They need to accept that some craft workers may want to undertake higher level training and education than what they perceive is needed. The industry also needs to attract graduates in not only managerial roles, but also as 'hands-on' technicians or highly skills material technologists. The practical element of this training needs to be delivered during or after degree course completion. Employers need also to consider making the jobs attractive to graduates in terms of salary and job role.

6.5. EXAMPLE OF HIGHER EDUCATION SUPPORTING SMALL FIRMS: UNIVERSITY OF LUTON – BUSINESS SERVICES

The University of Luton provides an example where industry can be supported by higher education. There is no evidence to suggest that there is such a facility for the marine industries in the southeast. Respondents in the survey for this report were reluctant to contact an HE organisation on the grounds of cost. The BMIF does, however, provide a business information and technical service, but this is limited.

The university has created a raft of initiatives to provide a link between themselves and businesses. These initiatives include a centre for competitiveness, business consultancy services, training services, research and a centre of entrepreneurial studies that are dedicated to promoting SME's and providing help. The University also helps to support the Innovation Centre, an incubation centre for new enterprises by providing:

- Close links with university facilities and access to equipment, technical support, experienced staff, information and library resources including:
- Collaborative ventures with the university or other resident companies.
- Commissioned projects.
- Co-operative based initiatives.

Currently no such equivalent exists in the UK or the region to specifically assist the marine sectors. Therefore there is no central point of contact between enterprise, education and training bodies, and NTOs. There is no shop window for HE to offer its facilities and know-how to industry; there appears to be no forum on which employers can discuss changing curricula needs with training providers.

7. CONCLUSIONS

Initially this project aimed to analyse emerging higher skill needs in the region's boat building and marine electronics sector. The research carried out, however, revealed that the skills problems that many employers in the sector face are more fundamental. It was found that there was a serious mis-match between the demands of employers and the supply of skills from the labour market. Forecasts based on the demographic profile of the region, trends in education, the impact of Government policy and economic factors show that this situation will not resolve its self. It needs to be tackled strategically.

The research found that the boat-building sector in the region had a low demand for graduate skills. On the production side, graduates were sometimes found working as a CAD operator or designer, although many owner managers preferred to fill these types of jobs with former craftsmen. Former craftsmen were also found to predominate as supervisors, project managers, line and production managers. Builders who were run by owner managers were focused on production; employees therefore had to be immediately useful. The only training scheme found in operation was the modern apprenticeship scheme, which employees found was not fulfilling their needs because of high attrition rates, lack of control and alleged poor quality of trainee.

The marine electronics sector can be split into two: firstly, those companies that retail, fit and maintain equipment, and secondly, designers and manufacturers. The companies that specialise in fitting and retailing face problems common to boat builders have enjoyed a period of rapid growth, but find it difficult to recruit field engineers and technicians. They also have the added problem that, currently, there is no recognised course or qualification for marine electronics. They depend upon recruiting people with some technical knowledge at different levels and an enthusiasm for boats and the products.

Manufactures on the other hand tend to be much larger companies and think about their needs more strategically. Their products determine their skills needs. In general there is a move away from specialised stand-alone equipment that has dominated the popular market towards generic electronics with more emphasis on multifunctionism and increased software dependency. The case study used in this report shows that management skills are as important as technical skills to the industry, as shown by this company's use of automotive style production management techniques to boost output, improve quality and aid key worker retention.

7.1. BOAT BUILDING

It is clear from the research that there has been a change in the labour market for skilled craft workers and technicians in the Solent area. The current conditions in the market pose a significant threat to the region's boat builders, so much so that if the problem is allowed to persist, it may force firms to move their production away from the region or cease building boats altogether. The solution to these problems lies inextricably with the management of firms in the sector. There is a need for them to re-assess the labour market situation and to form a strategy to overcome the problem. The strategy that is recommended in this report needs also to be underpinned with action at a policy level by SEEDA, the BMIF, EMTA and relevant training and education organisations.

Below, are the main points from the research in more detail:

7.1.1. Craft worker shortage

The shortage of skilled craftsmen that is being currently felt will not remedy itself. Poaching of workers is rife, there is evidence to suggest high wage inflation: these are factors that will continue to de-stabilise the labour market and decrease a firm's ability to compete. Although there will be an increase in the numbers of young people in the region by 2004, the high attrition rates experienced by employers will more than mitigate this increase. If growth in the industry continues, this shortage will become a major threat to productivity and to the competitiveness of many firms in the sector.

The MA scheme in its present form is obviously not working for the sector. The wastage rates of cohorts that employers have been experiencing are clearly unacceptable. Employers have lost faith in it. It is axiomatic that the current mechanisms for supplying skilled craft and technical workers require re-appraisal.

Moreover, not only does the way that skilled manual workers are trained in the sector need review, but also some initiative is required in order to attract people, and also retain people in the industry.

If boat builders wish to stay in the Solent area, and wish to continue building boats for their existing markets, they must therefore start to address these issues both at a tactical level and also at a strategic level.

Employers must concentrate on worker retention and also on selection of apprentices. It may in the long term, be more beneficial to offer enhanced

employment terms for apprentices, but employ less than they do now but aim to retain more. As part of the retention process, employers need to have more control over the training process; the training needs to be centred in the workplace. This will allow employers to monitor their apprentices' progress more closely as well as benefiting from a greater output of commercial work from trainees.

Employers must also consider the effects on the labour market of recent trends in education. Employers must expect to employ more graduates in the future in both managerial and technical roles. A degree qualification for many is no longer as esoteric as it once was; it is becoming a fundamental qualification. Employers must also accept that employees may like to aim for higher qualifications than are required: employers need to make some sort of provision to give their staff the opportunity for further training and accreditation of skills, even if that extents to degree, foundation degree, NVQ4+ level.

7.1.2. Management skills

It seemed in the course of research for this project that owner managers concentrated mainly on day to day issues: the style of some managers was very much hands-on, they were concerned with fire fighting problems as they occurred. The types of management issues in small companies that have been studied by researchers after the publication of the Bolton Report (1971) are still current for owner managers in the boat-building sector.

The backgrounds of owner managers in the sector appears to be technical. Through the use of ad-hoc courses, certain skills have been picked up by managers, such as project management. However, the courses that are undertaken and the main efforts of managers are concerned with fire fighting problems and ensuring orders for products are completed. The development of strategies to cope with emerging problems appeared to have low priority or was non-existent.

A number of factors, including changing labour markets, globalisation and regulation will increase the need for good strategic management skills if these companies are to survive in the future. Owner managers will need to undertake upskilling in this area. This in turn needs to be supported by initiatives to ensure that relevant course provision is available in an acceptable format to managers.

7.1.3. Perception of Graduates in the Sector

There is a serious mismatch between sector employer, employee, and educational expectations of modern graduates. The smaller boat-building and electronics companies have an outdated perception of graduates. This perception is of a pre 1990s graduate, is of employees who are elitist, and educated to an intellectual and skills level beyond the needs of the sector. It is thought that these graduates would not find any job satisfaction and would leave the companies prematurely. The reality is that there is a good supply of modern graduates, many educated with broad and practical skills. With a greater participation in higher education, job expectations of graduates maybe lower than in previous years. The advantages of employing graduates are not apparent to some employers in the sector. This is an area that needs to be addressed. This attitude to graduate employment is less apparent in the larger electronic companies, who take a strategic view of human resource management. However this area that needs addressing if the sector is to benefit from modern higher education.

One very specific problem relates to the supply of engineering graduates. There is a national reduction in the demand for degree courses in engineering and subsequently a reduction in the provision of these courses by universities. The problem is not specific to the marine field, but is common to all engineering areas. Moreover, many universities are unable to provide the practical experience that employers prefer, workshop time for example, because of funding levels. If there is an increased demand for engineering graduates, the university sector may not be able to supply.

7.2. ELECTRONICS

For smaller companies in this sector, especially retailers and fitters, face similar problems to boat builders. They are currently attempting to put together a new course to accommodate their training needs, but once again, the wish to maintain control over quality. Furthermore, they are attempting to put their course together in isolation; they need to work more closely with education and training providers who have the experience and know-how to ensure success of the initiative. There are also clear opportunities here for further co-operation between the industry and higher education providers who could develop specialist marine electronics courses at HND and degree level.

Although the manufacturer that was included in this study had a more strategic approach to manpower issues they still find it difficult to recruit

engineering and technical staff. Trends in product development and design will mean that more emphasis will be placed on software. However, trends in engineering degree and HND course entries, indicates that it is likely that the problems concerning recruitment of electronic and mechanical engineering will not diminish despite more emphasis on software. Furthermore, the marine electronics companies' abilities to compete with the IT sector for software experts are unknown.

7.3. SUMMARY OF EMERGING SKILLS NEEDS

- Owner managers in boat building lack strategic management skills. If their companies continue to expand, these skills will become more important to their success.
- The boat building sector is highly dependent upon skilled craftsmen and technicians in the production process. There is a clear need to increase the numbers of people in training to become boat building technicians and craft workers. Although more work is required to quantify and measure the current workforce, it will become necessary to replace workers who leave or retire from the industry.
- There will need to be training and education provision to match the industry's needs; that is, employers need to have more control than at present. Furthermore, the qualifications and level of accreditation needs will become more supply driven rather than demand driven.
- Further to above, there is a need to develop courses and qualifications for supervisory and line management workers to progress beyond NVQ3.
- There is a lack of opportunities for new graduates in the industry. There needs to be support to provide degree students with more practical experience: this lack of hands-on expertise is a major barrier to the employment of graduates in the industry.
- Specifically for marine electronics, the move towards integrated, centralised systems for navigation and management of boats will impact on the skills needs of engineers. This will affect both manufacturing and design as well as further down the supply line in retail and fitting.
- Moreover, manufactures may have to depend upon recruiting software engineers without specific marine knowledge. Short 'marinisation' courses need to be made available to employers.

8. RECOMMENDATIONS

This last section contains recommendations for best practice made to both employers and also to SEEDA / HESE. These recommendations have been categorised by the length of time that it is thought that they would take to initiate and whether they are considered tactical or strategic, in the short, medium or long term. Moreover, many of the recommendation that have been made would allow the industry to be more self sufficient for the future.

8.1. RECOMMENDATIONS TO EMPLOYERS

The problem of supply of skilled craftsmen and technicians to the boat building industry will not remedy itself. Employers in the sector therefore must adopt short-term tactics and a long-term strategy to ensure that future highly skilled and trained craft workers are available for the future. Owner managers need to adopt a more strategic view of their company, rather than concentrating on product sales, problem solving and getting "the goods out of the door".

8.1.1. Short term

I. Employers need to concentrate on retention of craft workers in their employ. Methods of doing so that do not include wage rises are well documented.

II. Owner managers especially, but not exclusively, need to consider undertaking some type of strategic management training, especially in the area of human resource issues. Supply of this type of training, either part-time, or through distance learning, is plentiful.

8.1.2. Medium term

III. Employers need to consider spreading their recruitment net wider and concentrate on quality and not quantity. In order to benefit in the long term from training they must make sure in their recruitment process that workers not only have the right skills that they require, but also have the right attitude. This can be achieved through an enhanced selection process. In this way employers should be able to recruit fewer trainees but

retain more. This paradigm shift in part can be achieved through involvement with management training.

IV. They must consider the employment of more women in craft roles and also the employment of older workers that would normally fall outside of the age range in the MA scheme.

V. In order to formulate strategic plans, there is also a need for employers to understand current social and attitudinal trends in education and training.

8.1.3. Long term

VI. There is a clear need for boat builders especially, to co-operate with each other on a different level. They must ensure that there are suitable methods for training and assessment that meet their needs. This can only be achieved through co-operation with each other and interaction with training and education bodies and providers.

VII. Employers must consider that for many jobs, such as mechanical and electrical technicians for example, for which the training has traditionally been based upon HND / HNC qualifications, must be replaced with training through higher education at degree level.

8.2. RECOMMENDATIONS TO HESE & SEEDA

In order to ensure the future of a competitive marine technology industry in the region there is a necessity for intervention by a third party. This intervention is driven in by a labour market failure to supply skilled people to the industry and also by the lack of strategic management skills of many owner managers.

8.2.1. Short term

VIII. There is a clear need to follow on from the work done by the BMIF (Paterson *et al.* 2001) to quantify the craft skill problem. Further research in co-operation with the BMIF and EMTA, in the form of a wider scale and more in-depth survey is needed.

IX. A benchmark study is needed to compare and analyse the differences between production boat builders either in the UK or in Europe and those boat builders in the Solent region.

X. The industry in the UK is concentrated in the southern half of the country. Therefore, further work on this subject, including the research recommended in VIII, needs to be carried out in co-operation with the South West Development Agency.

XI. Employers need to be made more aware of the funding opportunities for graduate training, such as the graduate apprenticeship scheme and the teaching company scheme. This needs to be carried out in conjunction with Business Link. These can be achieved passively through a web site or a handbook, or actively through networking and the BMIF.

8.2.2. Medium term

XI. There is a clear need to encourage employers in the sector, especially small firms, to interact more with higher education providers. There is a wealth of technical knowledge, tangible facilities and training and education know-how, which goes virtually un-tapped by the industry. This type of partnership needs to be brokered and promoted by SEEDA / HESE.

8.2.3. Long term

XII. There needs to be a review of the way that trainees in the sector are trained. There is a clear need to place the control of the training of workers into the hands of employers. Apprentices need to be trained in the workplace 100% of their time without the need for day release. Whether this would be done by individual employers for their own trainees or by appointed firms (such as Jago Developments for example) in a region would be the subject of further research and discussion.

XIII. There is also a need to consider, as an aid to retention especially, the continued professional development of craft and technical workers. There is a need to encourage more life long learning. This can be achieved through higher NVQ levels, such as four and five, or through the new Foundation Degree system. In order to achieve this, mechanisms need to be in place to deliver learning in a flexible way.

XIV. There is also a requirement for the co-ordination and support of engineering degree courses for the future in the region. Provision may be inadequate if current educational trends persist.

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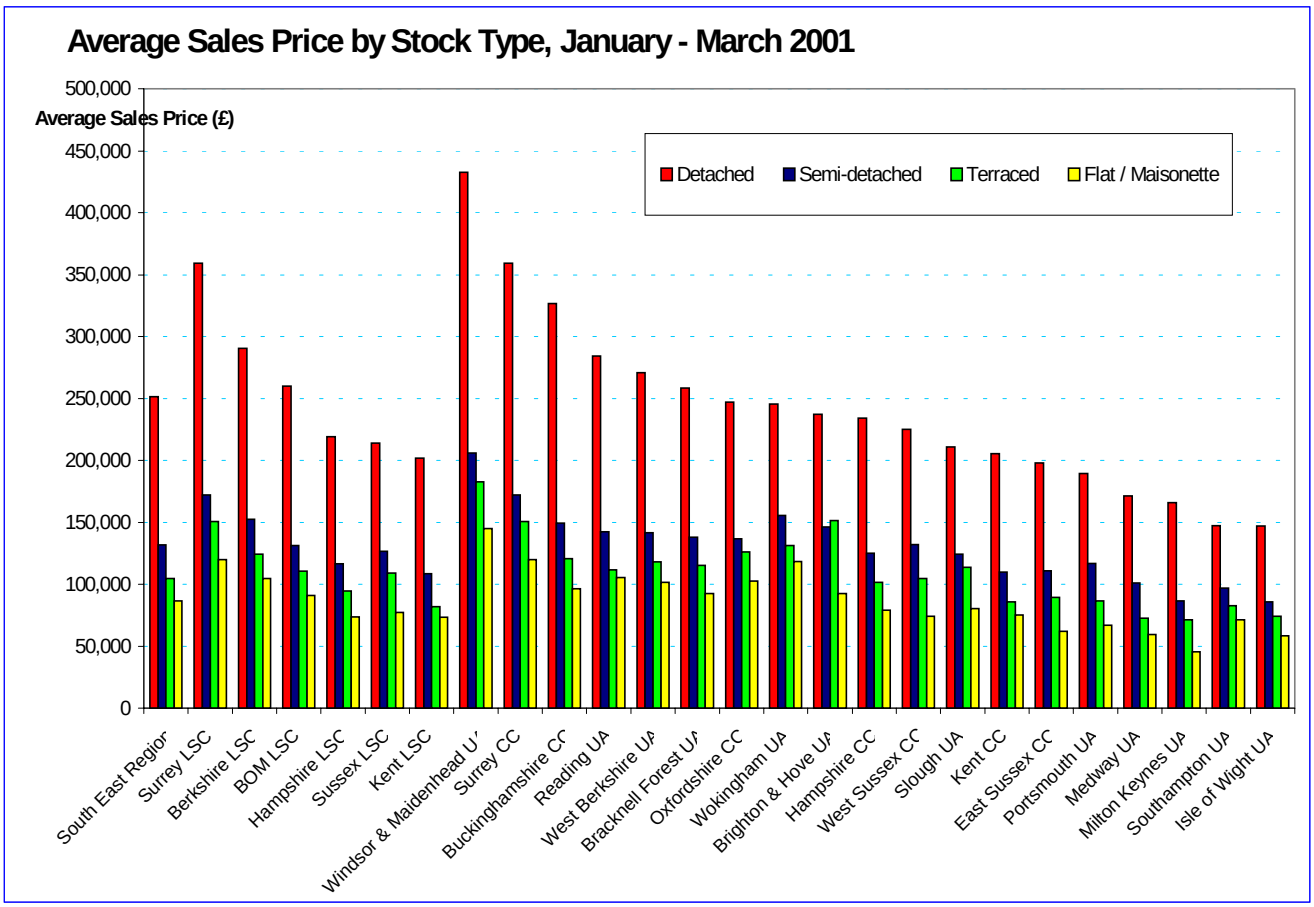
Annex A

Source : Skills Insight [on-line] www.skills-insight.org.uk



Annex B

NATIONAL PROVISION OF MARINE TECHNOLOGY HIGHER EDUCATION COURSES AS LISTED BY UCAS (2000)

1. Blackpool and The Fylde College (An Associate College of Lancaster University) (B41)

Maritime Studies	3FT deg BSc	J600

2. Cornwall College With Duchy College (C78)

Marine Craft Technology	2FT HND	106J
Maritime Studies	2FT HND	006J
Surf Science and Technology	2FT HND	64JH

3. University of Glasgow (G28)

Advanced Marine Design	5FT deg MEng	J610
Nautical Science	3FT deg BSc	J600
Naval Architecture & Ocean Engineering	4FT/3ACC deg BEng	J625
Naval Architecture and Ocean Eng/Eur St (MEng)	5FT deg MEng	J627

4. Heriot-Watt University, Edinburgh (H24)

Offshore Eng (Chemical & Process Eng) (MEng)	5FT deg MEng	J657
Offshore Eng (Electrical and Elec Eng) (MEng)	5FT deg MEng	J655
Offshore Engineering (Chemical & Process Eng)	4FT deg BEng	J656
Offshore Engineering (Civil Eng) (MEng)	5FT deg MEng	J651
Offshore Engineering (Civil Engineering)	4FT deg BEng	J650
Offshore Engineering (Electrical & Elec Eng)	4FT deg BEng	J654
Offshore Engineering (Mechanical Eng) (MEng)	5FT deg MEng	J653
Offshore Engineering (Mechanical Engineering)	4FT deg BEng	J652

5. The University of Liverpool (L41)

Civil and Maritime Engineering (MEng)	4FT deg MEng	HJ26

6. Liverpool John Moores University (L51)

Marine Operations (2 Yrs/3 Yr SW)	2FT/3SW HND	036J
Marine Operations (Ordinary)	3FT/4SW deg BSc	J630
Maritime Engineering	2FT/3SW HND	106J
Maritime Engineering	3FT/4SW deg BTech	J603
Maritime Studies	3FT/4SW deg BSc	J601
Maritime Technology	3FT/4SW deg BSc	J602
Nautical Science	3FT deg BSc	J600
Nautical Science (Seafaring) (3 Yrs)	3FT HND	056J

7. University of Newcastle Upon Tyne (N21)

Naval Architecture (BEng)	3FT deg BEng	J620
Naval Architecture (MEng)	4FT deg MEng	J624
Offshore Engineering (BEng)	3FT deg BEng	HJ36
Offshore Engineering (MEng)	4FT deg MEng	JH6H
Small Craft Technology (BEng)	3FT deg BEng	J610
Small Craft Technology (MEng)	4FT deg MEng	J614

8.Pembrokeshire College (P35)

Leisure Boat Design	2FT HND	346J
Sail and Power Boat Studies (HND top-up)	1ACC deg BSc	J610

9.University of Plymouth (P60)

Coastal and Ocean Environments	3FT deg BSc	F9J6
Fisheries and Aquaculture	3FT deg BSc	CJ16
Marine Technology	3FT deg BSc	J600
Marine Technology (MEng Option)	3FT/4SW 4FT/5SW de BEng	J612
Nautical Studies	3FT deg BSc	J603

10. University of Southampton (S27)

Engineering Management (Ship Science)	4FT deg MEng	JN61
Engineering with Foundation Year -(Ship Science)	4FT deg BEng	Y108
Ship Science	3FT deg BEng	J640
Ship Science with European Studies (MEng)	4FT deg MEng	J645
Ship Science/Advanced Materials (MEng)	4FT deg MEng	J644
Ship Science/Multi-disciplinary	4FT deg MEng	J641
Ship Science/Naval Architecture (MEng)	4FT deg MEng	J642
Ship Science/Yacht and Small Craft (MEng)	4FT deg MEng	J643

11.Southampton Institute (S30)

Maritime Studies	3FT deg BSc	J600
Maritime Studies (with foundation)	4FT deg BSc	J608
Merchant Ship Operations	3FT deg BSc	J641
Shipping Operations	3FT deg BSc	J640
Yacht Manufacturing and Surveying	3FT deg BSc	J613
Yacht Manufacturing and Surveying (with found)	4FT deg BSc	J614
Yacht and Powercraft Design	3FT deg BEng	J610
Yacht and Powercraft Design (with foundation)	4FT deg BEng	J618

12.The University of Strathclyde (S78)

Advanced Marine Design	5FT deg MEng\AMD	J612
Naval Architecture	5FT deg MEng	J621
Naval Architecture & Ocean Eng with European St	5FT deg MEng	J6T2
Naval Architecture and Ocean Engineering	4FT deg BEng	J622
Naval Architecture and Offshore Engineering	4FT deg BEng	J600
Naval Architecture and Offshore Engineering	5FT deg MEng	J601
Naval Architecture and Small Craft Engineering	4FT deg BEng	J610
Naval Architecture and Small Craft Engineering	5FT deg MEng	J611

13. University College London (University of London) (U80)

Naval Architecture and Marine Engineering	3FT deg BEng	HJ3Q
Naval Architecture and Marine Engineering (MEng)	4FT deg MEng	HJ3P
Ship Science/Yacht and Small Craft (MEng)	4FT deg MEng	J643

ANNEX C

Survey of graduate destinations after one year

Southampton Institute Student Destinations 1996 – 2000/01

Degree	Year of graduation	Total No. of students on course	Response Rate	Employed*	Employed in boat building, equipment or sales	Study / Training*	Unemployed*	Not available for employment*	Overseas*	Further Study / Courses*
BEng Electronic Engineering	1996	4	4 / 4 (100%)	75.0%		25.0%				1. MSc Medical Electronics – Hertfordshire University
	1997	8	8 / 8 (100%)	87.5%		12.5%				1. City & Guilds IT Diploma – Salisbury College
	1998	3	3 / 3 (100%)	100%						
	1999	10	10 / 10 (100%)	90%			10%			
	2000	15	12 / 15 (80%)	100%	(1) 8.3%					2 undertaking further p/t study

	Year of graduation	Total No. of students on course	Response Rate	Employed*	Employed in boat building, equipment or sales	Study / Training*	Unemployed*	Not available for employment*	Overseas*	Further Study / Courses*
BEng Maritime Technology	1996	8	7 / 8 (87.5%)	71.4%			14.3%	14.3%		
	1997	10	8 / 10 (80%)	87.5%	1		12.5%			
	1998	11	8 / 11 (72.2%)	87.5%				12.5%		
	1999	9	8 / 9 (88.9%)	75%		25%				1. IT - Heriot-Watt University; 2. Marine Engineering – Southampton University
	2000	3	3 / 3 (100%)	33.3%	0 (0%)	33.3%		33.3%		

BEng Yacht and Powercraft Design	1996	32	29 / 32 (90.6%)	58.6%	6	13.8%	3.4%	3.4%	20.7%	1. MA Computational Fluid Dynamics – Southampton University 2. MSc Naval Architecture – Southampton University 3. MSc Yacht & Small Craft – Southampton University PGCE – Southampton University
	1997	29	23 / 29 (79.3%)	60.9%	3	8.7%	13.0%	17.4%		1. MSc Maritime Engineering Science (2 Students) – Southampton Institute

	Year of graduation	Total No. of students on course	Response Rate	Employed*		Study / Training*	Unemployed*	Not available for employment*	Overseas*	Further Study / Courses*
	1998	22	12 / 22 (54.5%)	91.7%		8.3%				1. MSc Yacht and Small Craft Design – Southampton University
	1999	24	14 / 24 (58.3%)	92.9%		7.1%				1. MSc Yacht and Small Craft Design – Southampton University
	2000	26	15 / 26 (57.7%)	73.3%	11 (73.3%)	20.0%		6.7%		
BA Maritime Leisure Management	1997	88	72 / 88 (81.8%)	83.3%	7	2.8%	8.3%	5.6%		1. PGCE – Cambridge University 2. PGCE – Aberystwyth University

	Year of graduation	Total No. of students on course	Response Rate	Employed*	Employed in boat building, equipment or sales	Study / Training*	Unemployed*	Not available for employment*	Overseas*	Further Study / Courses*
	1998	74	60	85%			5%	5%		
	1999	56	42 / 56 (75%)	78.6%		4.8%	2.4%	14.3%		1. PGCE - University of Brighton 2. PGCE – University of Bristol
	2000	50	42 / 50 (84%)	76.2%	unknown	2.4%	11.9%	9.5%		1. HND Sports Science – Camborn College
BSc Maritime Studies	1996	51	47 / 51 (92.2%)	72.3%	4	6.4%	4.3%	12.8%	4.3%	1. PGCE Geography – Bath University 2. City & Guilds IT – Southampton City College 3. MA Maritime Studies – Sheffield University

	Year of graduation	Total No. of students on course	Response Rate	Employed*	Employed in boat building, equipment or sales	Study / Training*	Unemployed*	Not available for employment*	Overseas*	Further Study / Courses*
	1997	53	41 / 53 (77.4%)	80.5%	4	7.3%	4.9%	7.3%		1. MSc Information Systems – Portsmouth University 2. MSc Coastal and Marine Resources Management – Portsmouth University 3. Basic to Bearnaise (cooking) – Cookery at the Grange – Frome
	1998	36	33 / 36 (91.7%)	60.6%			18.2%	21.2%		
	1999	29	23 / 29 (79.3%)	56.5%		4.3%	17.4%	21.7%		1. MSc Marine Technology – Cranfield University
	2000	32	27 / 32 (84.4%)	85.2%	7 (30%)		14.8%			

	Year of graduation	Total No. of students on course	Response Rate	Employed*	Employed in boat building, equipment or sales	Study / Training*	Unemployed*	Not available for employment*	Overseas*	Further Study / Courses*
HND Engineering (Electronics and Communications)	1996	23	19 / 23 (82.6%)	73.7%	1		21.1%		5.3%	
	1997	20	18 / 20 (90%)	94.4%		5.6%				1. BEng Electronic Engineering – Southampton Institute
	1998	9	7 / 9 (77.8%)	43%		14.3%	28.6%	14.3%		1. BEng Electronic Engineering – Southampton Institute
	1999	13	9 / 13 (69.2%)	77.8%		11.1%	11.1%			1. BEng Electronic Engineering – Southampton Institute
	2000	10	5 / 10 (50%)	100%	(1) 20%					

HND Engineering (Naval Architecture)	1996	12	10 / 12 (83.3%)	60.0%		30.0%	10.0%			1. BEng Naval Architecture –Newcastle University 2. BEng Naval Architecture and Ocean Engineering –Glasgow University BSc Naval Architecture – Glasgow University

	Year of graduation	Total No. of students on course	Response Rate	Employed*	Employed in boat building, equipment or sales	Study / Training*	Unemployed*	Not available for employment*	Overseas*	Further Study / Courses*
	1997	14	10 / 14 (71.4%)	40.0%	1	50.0%		10.0%		1. Models – Lycée Questembas, France 2. Ship Models - Lycée Questembas, France 3. BEng Maritime Technology – Southampton Institute 4. BEng Yacht & Powercraft Design – Southampton Institute 5. BEng Mechanical Engineering & Aeronautical Design – University of Brighton

HND Yacht Manufacturing Technology & Marine Industries Management 1999 re-named to: HND Yacht Manufacturing Management	1996	28	26 / 28 (92.9%)	84.6%	7	7.7%	7.7%			1. BSc Technology – Plymouth University 2. Yacht Design – Boat Building & Design Marine, USA
	1997	28	23 / 28 (82.1%)	87%	9	4.3%	4.3%	4.3%		1. Marketing – Mercator (Belgium)
	1998	18	14 / 18 (77.8%)	64.3%		14.3%	14.3%	7.1%		1. BA Business Management – Manchester Metropolitan University 2. BSc Business Technology – Southampton Institute
	1999	19	9 / 19 (47.3%)	88.9%		11.1%				1. BSc MST – Southampton Institute

	Year of graduation	Total No. of students on course	Response Rate	Employed*	Employed in boat building, equipment or sales	Study / Training*	Unemployed*	Not available for employment*	Overseas*	Further Study / Courses*
	2000	15	13 / 15 (86.7%)	84.6%	38% (5)		15.4%			3 undertaking further p/t study
HND Yacht Design and Operation	1999	8	2 / 8 (25%)	50%		50%				1. BSc Yacht Manufacture and Surveying – Southampton Institute
	2000	4	4 / 4 (100%)	50.0%	25% (1)	50.0%				1. BSc Maritime Studies – Southampton Institute

* Indicates the % of destinations based on the response rate of those returning the careers office questionnaire, it does not represent the total number of graduates.