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A COMPARATIVE ASSESSMENT OF TRAINING COURSES FOR KNOWLEDGE TRANSFER PROFESSIONALS IN THE UNITED STATES, UNITED KINGDOM, AND JAPAN

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Lee WOOLGAR

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Ministry of Education, Culture, Sports, Science and Technology

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Lee WOOLGAR
National Institute of Science and Technology Policy
Ministry of Education, Culture, Sports, Science and Technology
Marunouchi 2-5-1, Chiyoda-ku, Tokyo, 100-0005, Japan
Tel: + 81 (03) 3581 0968
Fax: + 81 (03) 5220 1257
woolgar@nistep.go.jp

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Abstract

This policy study looks at training courses for personnel associated with university-industry (UI) links in the United States, United Kingdom and Japan. Across the OECD, governmental policy measures increasingly emphasize the role of universities in assisting economic growth. Research has suggested that an important factor in the successful exploitation of university technologies and knowledge rests on the skills and abilities of those employed in university technology transfer or outreach offices. The provision of professional training opportunities for staff in these organizations may assist the processes of technology or knowledge transfer and a number of organizations have emerged that seek to provide such opportunities. Looking at examples from the US, UK and Japan, this report observes that a comprehensive range of training courses exist that address technology licensing issues, financing and management of spin-out companies, business planning methods, the drafting of research contracts, negotiation practices, or the identification and marketing of technologies, amongst a range of other courses.

Amongst the three countries, organizations in the United States and United Kingdom provide the most comprehensive range of courses specifically for technology transfer personnel. These cover most aspects of UI links and address skill requirements for professionals at different stages of their career. In Japan, by contrast, many courses are academically oriented or targeted principally at the business community. Course provision appears to be concentrated predominantly towards technology licensing, with fewer opportunities to learn of other types of issues relevant to UI links. There may also be insufficient opportunities to take courses at different stages of career. While these distinctions have been observed, the report stresses that further research should assess the needs of technology transfer personnel in Japan to locate the desirability of further course development and the means by which this could be implemented. Some tentative policy ideas are also discussed, especially in relation to the Comprehensive Strategy for Personnel with Intellectual Property Skills developed by the Cabinet Office in 2006.

Keywords: *University-Industry Links, Knowledge/Technology Transfer, Skill Development, Training Courses, Continued Professional Development*

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Tables and Boxes

Abbreviations

AURIL	Association of University Research and Industry Links (UK)
AUTM	Association of University Technology Managers (USA)
CPD	Continued Professional Development
DTI	Department of Trade and Industry (UK)
FTE	Full Time Equivalent
HERD	Higher Education Expenditure on R&D
IPHQ	Intellectual Property Headquarters (Japan)
JIPA	Japan Intellectual Property Association (Japan)
JST	Japan Science and Technology Agency
LES	Licensing Executive Society (USA)
LESI	Licensing Executives Society International
MIT	Massachusetts Institute of Technology (USA)
METI	Ministry of Economy, Trade and Industry (Japan)
MEXT	Ministry of Education, Culture, Sports, Science and Technology (Japan)
NCIPI	National Center for Industrial Property Information and Training (Japan)
OECD	Organization for Economic Cooperation and Development
PPP	Purchasing Power Parities
TLF	Technology Liaison Fellow (Japan)
TLO	Technology Licensing Organization (Japan)
TUS	Tokyo University of Science (Japan)
UI	University-Industry
UNICO	The Universities Companies Association (UK)
UK	United Kingdom
USA	United States of America

1. Introduction

Policy makers across the OECD have sought to introduce policies or laws that support knowledge transfer from universities to industry. The United States (USA) was a pioneer in this activity through passage of the Bayh-Dole Law (PL 96-517), that has since come to be replicated by other countries (Mowery et al. 2003). In Japan, the Technology Transfer Law (Law Number 52) allowed Technology Licensing Offices to license university technologies to industry. In 2002, the idea of making Japan a 'nation built on intellectual property' saw the initiation of a series of legal initiatives to enhance patent policy and establish intellectual property headquarters in universities. In 2004, ownership of intellectual property passed to universities following their incorporation and independence from government. Japanese universities have subsequently accumulated a number of organizations for managing relations with industry, such as Technology Licensing Offices (TLOs), Intellectual Property Headquarters (IPHQs) and Incubation Centres or other outreach offices. As of 2006, there were 41 recognized TLOs (JPO 2006) and 34 IPHQs.

Academic research on university technology transfer has found that skills embodied in licensing offices can have an important influence on institutional UI performance (Thursby and Kemp 2002; O'Shea et al. 2005; Siegel et al. 2003). However, finding people with the right qualities and experience to work in knowledge transfer organizations can be an important issue for countries that seek to develop UI links. Personnel with a range of educational backgrounds and work experience spanning academia and industry can be desirable. The range of skills required for knowledge transfer vary considerably and relate to understanding technology, its applicability and market potential, possible adopters or licensees; the underlying nature of contracts, intellectual property law, costing processes for research contracts, licensing agreements or the processes involved in spin-off formation. In addition, negotiation, planning, team working ability, information collection and management as well as managing relationships are all important. In short, knowledge transfer personnel require a broad range of skills to effectively perform their role.

In recognizing the broad range of knowledge and skills that are required, in many countries organisations that traditionally provided representation and information on technology

transfer are now involved in providing courses or special publications that can support the professional development of knowledge transfer personnel. For example, the Association of University Technology Managers (AUTM), which was initially established to lobby for consistent policies regarding funding and licensing of university technologies is now active in providing courses, producing best practice manuals to assist in technology transfer, and more generally representing and supporting technology transfer professionals. A similar trend has occurred in the United Kingdom through the activities of the Association of University Research and Industry Links (AURIL).

In this report we will compare the activities of different organizations in three major economies that are involved in training programmes for personnel employed in licensing or industrial outreach offices. We seek to locate the types of course provided, the level of provision, and who is involved in course delivery. The structure of the report will be as follows. After outlining the methodology in Section 2, Section 3 introduces an overview of the policy frameworks for UI links in the three countries. We will note the timescales of policy introduction and support from government. In Section 4, the types of activity in each country are outlined. We begin by looking at the United States and the activities of the AUTM, Licensing Executive Society, and Technology Transfer Society. We then look at the United Kingdom where we outline the activities of AURIL, PRAXIS, and the private company, Hawkesmere Plc. The third country in our study is Japan. Here we look at the recently established MOT courses, courses by the Japan Intellectual Property Association (JIPA), the Japan Association of New Business Incubation Associations (JANBO) and the activities of three universities, Tohoku University, Tokyo University and Tokyo University of Science.

In Section 5 we undertake a comparative assessment of the types of qualifications, courses, and organizations involved in course provision. We also outline the costs of each programme. In Section 6 we discuss the policy implications for Japan. We begin this section looking at recent policy activity and particularly the recent *Comprehensive Strategy for Personnel with Intellectual Property Skills* published by the Cabinet Office in 2006. We then link our study with these policy developments by outlining the possible importance of training for linking

with industry. We also look at how courses could be delivered before outlining some provisional recommendations. Considering the limitations of knowledge surrounding current profiles of Japanese technology transfer staff, and the possible demand for further training, Section 7 locates areas that are in need of further research. In Section 8 we provide some conclusions concerning our report, noting the characteristics of each country and types of course in use. The report is concerned specifically with the Japanese case and it is hoped that this may contribute to ongoing discussion of UI policy in Japan, and elsewhere.

2. Methodology

During July, August and September 2006, information on technology transfer programmes was obtained from policy reports, organizations and websites in the United States, United Kingdom and Japan. Information was collected on each country with respect to the range of organizations involved in training and in terms of the:

- Range of Courses Provided
- Content Outline for Courses
- Those Involved in Provision and Tuition
- Course Costs

Undergraduate courses in knowledge management were excluded, with the search focusing upon postgraduate level training and training targeted particularly at professional development. This report does not claim to be a comprehensive listing of all courses provided in each country, but merely to provide information on some of the types of training programmes that are in place.

3. Policy and Funding Frameworks

In this section, key developments with regard to major UI policies in each country will be outlined. We will also look at the funding context in each country.

In Table 1, country differences in the time-scale for introducing UI links policies are presented. The USA is the front-runner in terms of UI policy development, with many TLOs emerging in the 1970s, and major policy change occurring on the basis of the Bayh-Dole Law (PL 96-517) in 1980. The UK followed US developments closely introducing similar measures during the 1980s, with British universities granted rights to exploit intellectual property from the British Technology Group in 1985. Many universities, such as Oxford

University or Imperial College, established licensing offices following this change. Japan, on the other hand, only began to implement such measures over the latter half of the 1990s following the introduction of the Technology Licensing Organization Law (Law 52, 1998) and the Industry Revitalization Special Measures Law (1999), which introduced the Japanese Version of the Bayh-Dole Law and reduced patent costs at universities. The major change in ownership of IP in Japan was not until 2004 with the granting of corporate status to the national universities.

Table 1 Timetable of Policy Change in the Three Countries

	USA	UK	Japan
Bayh-Dole Law or Similar	1980	1985	1999
Establishment of TLO	1970s	1980s	1998

Source: NISTEP (2005: 44)

Turning to funding, support could be observed in the UK and Japan by central government, but could not be observed in the USA, where aside from specific joint UI projects, there does not appear to be a central fund for supporting university licensing offices or the training of UI personnel. Whether such funding exists at the state levels or by other means is an issue requiring further research.

The Higher Education Funding Council for England (HEFCE) and Office of Science and Innovation, Higher Education Innovation Fund (HEIF), has set aside funding for two years (2006-2008) to support knowledge transfer activities at universities (HEFCE 2005). Most of this competitively allocated financing has gone to support networking facilities and provide finance for universities to develop capability to liaise with industry. It is not known what proportion of this funding goes for technology transfer staff development. Furthermore, in 2003, $627,200 (2003 PPP: $1 = 0.6272) was provided to three organizations, AURIL, PRAXIS and the Universities Companies Association (UNICO) (not covered in this report) to develop training opportunities for knowledge transfer professionals in the UK.

In Japan, a total of $40.5 million is currently used specifically to support personnel development. The Ministry of Economy, Trade and Industry (METI) provide $30.5 million (2005/6). This includes support for Management of Technology (MOT) courses in terms of

curriculum development ($4.2 million), fellowships provided by the New Energy and Industrial Technology Development Organization (NEDO), which support many of those employed in TLOs; provision of support for incubation managers ($1.1 million); internships, and support for specialist programme accreditation ($0.8 million) (METI 2005)). In addition, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) has provided $10 million to support personnel development and this includes support for technology coordinators (MEXT 2005). Other kinds of support should also be acknowledged, such as that provided by the National Center for Industrial Property Information and Training (NCIPI) which dispatches Patenting Licensing Advisors to TLOs (Japan Patent Office 2005).

4. Country Studies

In this section course provision in the United States, United Kingdom and Japan will be discussed. We will begin our discussion with the United States.

4.1 The United States

This section will begin with a review of personnel involved in knowledge transfer in the United States. The organizations involved in training course provision are then discussed.

4.1.1 Profile of US Technology Transfer Personnel

Little data could be obtained on the profile of staff involved in technology licensing offices in the United States. The AUTM Annual Licensing Survey provides basic data on the number of staff per office, but the questionnaire does not ask details about personal background. The Annual Licensing Survey shows that the level of total FTEs per TTO has increased from 413.5 in 1992 to 1,649.9 in 2004, of which 832.9 are licensing FTEs. This averages 4.3 personnel per licensing office (AUTM 2005).

4.1.2 US Organisations Involved in Course Provision

Our search revealed three organizations. These are:

- The Association of University Technology Managers (AUTM)
- Technology Transfer Society (T2S)
- Licensing Executives Society (LES)

We will begin by looking at the activities of the AUTM.

Association of University Technology Managers (AUTM)

The Association of University Technology Managers (AUTM) emerged from the Society of University Patent Administrators established in 1974. The AUTM currently has over 3500 members (2006) drawn from university licensing offices, research institutions, hospitals, business and government organizations. The AUTM is heavily engaged in the production of material to support UI activity, such as the production of the annual licensing survey, information leaflets through the AUTM Educational Series which focus on key elements of the technology transfer process; provision of information about scholarships, such as the Bayh-Dole Fellowship in Public Policy or the Bremer Scholarship; information surrounding regional meetings and learning opportunities as well as information on courses provided by other institutions and business schools. The AUTM also produce a Technology Transfer Practice Manual covering important laws and regulations, management issues, or licensing and negotiation strategies. There are around twenty special interest groups within the AUTM covering themes related to technology transfer, biotechnology, international management, pharmaceuticals, regional economic development, or venture capital. One special interest group addresses Career Development in Technology Transfer. The activities of this interest group relate to discussion and advice on qualifications necessary to work in technology transfer, the types of skills and experience desirable for work in the field, and on-going training issues. This interest group hosts special sessions at the AUTM Annual Meeting.

AUTM Annual Meeting

One of the main forms of training provision is the AUTM Annual Meeting, which runs over three days and concentrates on discussion and practical examples of the workings of the knowledge transfer process. The Meeting has keynote speakers similar to an academic conference, but the main function of the conference is to broaden the skill base of the technology transfer community. The 2006 Annual Meeting had 11 Educational Tracks, 46 Workshops and two special interest group meetings, including 24 sessions (AUTM 2006).

The educational tracks presented in Table 2 below occurred on the first day of the conference

over an hour and a half. Educational tracks range from technology transfer and marketing strategies to introducing academic studies on technology transfer. Courses are provided by a variety of university, corporate and venture companies, some of whom are drawn from outside the United States, such as the University of Copenhagen, the University of Glasgow, ISIS Innovation (Oxford University), or York University in Canada. Looking at sample courses in Table 2, these cover topics such as the *Technology Valuation: Principles and Practice* course which looks at discounted cash flow analysis, and case studies. One course (*Different Perspective on Licensing*) is where industry can comment on university licensing efforts. The *Venture Capitalists Discuss Successful Practices for Technology Managers* course includes discussion on the components of IP licenses for early stage companies, compensation for academics, advisory board roles and pre-and post money evaluations.

Table 2. Educational Tracks from the AUTM 2006 Annual Meeting[1]			
Course Name	**Major Components**	**Delivery Agents**	
Technology Valuation: Principles and Practice	- Comparables and DCF analysis - Case Studies	Boston Univ. Scripps Research Inst.	Drug Royalty Corp. Inc. Charles River and Intecap
Venture Capitalists discuss Successful Practices for Technology Managers (life science companies)	- IP licenses to early stage companies - Academic founders roles and compensation - Scientific and business advisory board roles and composition - Pre- and post money valuations	BCM Technologies Inc. Elm Street Ventures Case Technology Ventures	Univ. of Minnesota BCM Technologies Inc. ARCH Development Partners
Strategies for Marketing Technology	- Overview of marketing ideas - Successful implementation and marketing techniques	Univ. of Florida Research Corporation Technologies Inc.	Innovation Policy Research
Different Perspective on Licensing: Industry talks to Academia	- Out-licensing of field of use IP and research tools - U.S. Supreme Court *Merck vs. Integra* (2005) ruling and implications.	Pfizer Global R&D Johns Hopkins Univ. Berlex Biosciences	Washington Univ. St Louis Pfizer Global R&D
University Start ups: A Formula for Success	- Period between identification and start-up - Developing technology into a product - Securing financial resources - Assembling a business team - Fatal mistakes	Utah State Univ. Research Foundation Univ. of North Carolina Univ. of Pennsylvania	
Technology Transfer and Economic Development	- How and whether TTOs should engage in economic development activities - Belgium, UK and the USA cases	Univ. of Copenhagen Univ. of Glasgow K.U. Levuen R&D ISIS Innovation	Novo Nordisk A/S New Economy Strategies Johns Hopkins Univ.
Licensing to Global Product Development Partnerships	- Global Product Development Partnerships - New Initiatives and Financial Support	MIHR-USA Seattle Biomedical PIPRA UC Berkeley	Univ. Georgia Rockefeller Foundation *and Others*
Technology Transfer Studies	- Academic papers on technology transfer	Various Universities	
Overcoming Institutional Barriers	- Case based examples for overcoming institutional barriers	Various Universities	
The Role of Universities as Civic Change Agents	- Emerging Initiatives - Breakout groups for discussion	York Univ. New Economy Strategies	Manchester Knowledge Capital
Advanced Topics in Equity Based Licensing: Strategies, Structures, Management and Sale	- University as founder - Diversifying your portfolio - Taking equity in limited liability corporations - Distribution of equity	Center for Technology McCausland, Keen and Buckman	Rockefeller Univ.

[1] http://www.autm.net/events/File/AnnualMeeting2006/AUTM06FP-SkedatGlance.pdf

Similar to the Educational Tracks, Workshops provided at the AUTM Annual Meeting are also of an educational and practical orientation. Box 1 provides five examples of workshops at the 2006 Meeting. Each workshop lasts for around one and a half hours. Workshops can range from *Career Development*, *IP Invention Disclosure Forms*, *Licensing Law Developments* or *Plants, Animals and Patents*. Interestingly, courses also occur on what can go wrong in technology transfer, such as the course covering *Really Crummy Deals*, which is provided by three universities (one from the UK) and a legal firm. Most courses at the Annual Meeting are provided by universities, the legal profession and business. These workshops are then followed by special interest group meetings, such as that by the *Career Development in Technology Transfer* group.

Box 1 Example Workshops: AUTM 2006 Annual Meeting

Workshop Name	Major Components	Delivery	
Plants, Animals and Patents	- Strategies for Overcoming Common Hurdles - Moral and Ethical Issues - Strategies for Protection and Commercialisation	Fulbright & Jaworsky LLP Wisconsin Alumni Research Foundation	Pizzeys Patent and Trademark Attoneys
Surviving Technology Transfer Career	- Guidance navigating the difficulties of a career in technology transfer	Various Universities	
Really Crummy Deals	- Description of worst deals - Why they turned out that way	Univ. Virginia Patent Foundation Princeton Univ.	Marshall Gerstein and Borun LLP Univ. College London
Drafting and Reformulating IP Policies and Invention Disclosure Forms	- Key Issues - Approval Process - Software and Distance Learning -	Mississippi Univ. Southern Illinois Univ.	UC Berkeley Louisville Univ.
Licensing Law Developments	- Enforceability of Post-expiration and Hybrid Royalties - Licensees and third party infringement - Common interest agreements - Attorney-client privilege	Stern, Kessler, Goldstein & Fox Franklin Pierce Law Centre	Columbia Univ. Univ. Texas Johns Hopkins Univ.

Other AUTM Courses

The AUTM also provide specific courses which run on an annual or bi-annual basis over a period of one to three days. These courses are:

- AUTM Basic Licensing Course
- AUTM Graduate Course
- Advanced Topics in Start-Up Business Development
- AUTM Tools Course
- Executive Forum
- Software and Digital Media Course

The *AUTM Basic Licensing Course* is a One-Day course intended for those that are new to the technology transfer profession. Workshops are intended to follow the lifecycle of technology transfer and include: 1) A primer in intellectual property law; 2) Triage: 3) Marketing; 4) Anatomy of a License; 5) Valuation; 6) Making the Deal; 7) University-Industry Relationships; 8) Managing Expectations. The courses are delivered by speakers from industry, universities and the legal profession.

The *AUTM Graduate Course* is a follow-up to the *Basic Licensing Course* and is designed for those with experience of technology transfer but who wish to develop their skill levels. This is a three-day course. Courses provided in 2005 focused upon: 1) Effective Leadership: Delegation and Team Productivity; 2) Provisional Patents: To File or not to File; 3) Economic Development: is it not really about the money? 4) The Art and Service of Licensing; 5) Conflict of Interest: How involved should the TLO be? 6) Brand Creation and Management for Technology; 7) The Science of Marketing Science; 8) The CREATE Act: Utilize and Neutralize; 9) Start-ups: Who, Why and What is the Value Proposition?

Advanced Topics in Start-up Business Development Course is a three-day course which has the following content: 1) Why Start-ups and How? 2) Understanding capital ownership in Rounds and Thinking like a venture capitalist; 3) Diligence/Valuation, Term Sheets and Risk Mitigation; 4) Building the Venture Team; 5) Anatomy of a Term Sheet; 6) IP issues and Start-up Documents; 7) Alternatives to Venture Capital Financing: Small Business Innovation Research Programme, Outsourced company research, Development and Angels; 8) Follow on issues with

Start-Ups. The courses are provided by university and venture capital related speakers.

The *AUTM Tools Course* is designed for TLO administrative and support staff and is a three-day course. Courses include: 1) Intellectual Property Primer, 2) Compliance, 3) iEdison [Extramural Invention Reporting Compliance Responsibilities]; 4) Networking Session; 5) Office Operations: Disclosures, Patents and Licensing; 6) Anatomy of a Licence; 7) Office Operations: Budgets and Royalty Tracking; 8) Databases. This course is delivered by speakers from universities and national research institutes.

Executive Forum occurs every two years with the first forum occurring in 2004. This is a two-day course aimed at senior technology transfer professionals to discuss current issues shaping technology transfer. The courses are oriented to leadership related issues. The 2006 meeting will cover: 1) Setting the stage for technology transfer leadership: 2) Checkpoint on Leadership; 3) Follow the Leader; 4) Balanced Scorecard – A good Approach to the Metrics Quagmire; 5) Sharing Information: Using Electronic Resources Effectively across your business; 6) Action Networks – How Real Organizations link up and cross connect to make things happen; 7) War Game – The changing role of the TLO and professional associations that support technology transfer.

The *Software and Digital Media* course is provided for technology professionals who work with software, digital media, databases, electronic data, websites and other university information sources. This is a two-day course and has the following course content: 1) Information and Inventions; 2) Open Source; 3) Application Developers' points of view; 4) Copyright and Rights Management; 5) Copyright and Trademark Protection for Software; 6) License Drafting and Formation; 7) University of Washington Software Digital Media Model; 8) Commercialization, Metrics, Outcomes; 9) Policy Issues Discussion: how new models might work in existing, patent-oriented TLOs.

Licensing Executive Society (LES)

The Licensing Executive Society (LES) was established in 1965 and is the North American component of the Licensing Executives Society International (LESI). LES membership comprises business executives, lawyers, licensing consultants, academics, scientists and

government officials. The LES provides networking opportunities, meetings, and two educational programmes. These educational programmes are *Technology Transfer Seminars* and the *Professional Development Series*. The main components of each of these programmes will be outlined.

LES Technology Transfer Seminar

The Technology Transfer Seminar is a two-day professional development course. These courses are provided in different parts of the country. The course is designed for professionals to supplement and improve their skills and capabilities, and is designed to provide an overview of core knowledge and current insights for those involved in technology transfer. The course comprises the following components: 1) Intellectual property primer; 2) IP Primer; 3) Anatomy of a License; 4) Valuation; 5) Ethics; 6) Opportunity Assessment; 7) Government/Academic/Industry Relations; 8) Negotiation; 9) Key Legal Issues in Licensing; 10) Structuring a Licensing Function and Organization (LES 2006). Networking sessions also feature as part of the programme.

Professional Development Series

The LES provide three levels of professional development spanning Fundamental, Intermediate and Advanced Levels. For Attorneys, the courses can be used towards *Continuing Legal Education Credits* with state bar associations. The *Fundamental Intellectual Asset Management* course covers: 1) The Basics of Intellectual Property and Licensing; 2) Filling and Managing the Portfolio (including planning, technology transfer criteria, negotiation techniques and principles); 3) The Deal (including pre-valuation, tax issues, valuation methods, negotiation techniques and principles); 4) Living with the Deal (post-agreement relationships and compliance, the process of managing intellectual assets). This is a three and a half day course and is offered in various cities throughout the US.

The *Intermediate Intellectual Asset Management Course* covers legal issues, intellectual asset strategy, valuation of intellectual assets, negotiation, ethics, and licensing. The course runs over four days.

The *Advanced Negotiation Skills Course* is a two day course and covers pricing exercises, frameworks for thinking about licensing negotiations, exercises related to contract negotiation, guidelines for negotiating, negotiation and licensing case studies, methods for building productive working relationships, building organizational capability for effective negotiation.

Technology Transfer Society

The Technology Transfer Society is another Society that provides courses through its local offices. The Society publishes an academic journal, the *Journal of Technology Transfer*, hosts an annual Dinner and supports international programmes. The Washington Area Chapter, the largest chapter of the society, provided training courses in 2003 and 2005.

The 2005 Course ran over 10 evenings between the months of September and November. Each course ran for three hours and covered the following areas: 1) Overview of Technology Transfer; 2) The Role of Alliances in Technology Transfer; 3) Intellectual Property Management: 4) Technology Licensing: Disclosure through Maintenance; 5) Maximizing the Value of University Generated Discovery; 6) Moving Federally Developed R&D to the Marketplace: Policy and Practice; 7) Factors in Transferring Technology to and from big businesses; 8) Factors in Transferring Technology to and from Small Businesses; 9) Technology Transfer Participative Case Study; 10) International Technology Transfer. Course tuition was provided by corporate executives, legal professionals, technology transfer professionals, and university administrators.

4.2 The United Kingdom

UK policy for UI personnel began to emerge on the basis of a report commissioned by the Department of Trade and Industry (DTI) and published in 2002 (Zietlyn and Horne 2002). This report found that the principal barrier faced by higher education institutions in the recruitment of knowledge transfer professionals was the identification of people with relevant skills and experience. They noted that it was unlikely that institutions would be able to recruit from the external environment to fill recruitment gaps as there was a shortage of people with necessary skills and experience. The solution was felt to lie in training those already employed in such organizations and supporting new entrants to the field. The report recommended the development of:

- Knowledge transfer induction materials for new entrants
- Knowledge transfer training courses
- A knowledge transfer training centre

It was also noted that demand for training was felt to be too small to drive business interest in supplying courses and it was recommended that the government play some role in supporting new course development (Zeitlyn and Horne 2002). The Lambert Review (2003) which noted that there was greater scope for technology transfer training implemented at the national level (Lambert 2003: 45) also suggested that national funding be increased for such training (Recommendation 4.3: 57).

4.2.1 Profile of UK Knowledge Transfer Personnel

Phillips has suggested that there are 1200 such staff in the UK (Phillips 2006), with Zeitlyn and Horne suggesting that there are 13 staff per institution (2002: 8). In comparison to both the USA and Japan, data on personnel involved in technology transfer in the UK is relatively rich. Table 3 shows the employment and educational background of technology transfer managers, practitioners and support staff. Most managers have a postgraduate qualification and scientific or managerial background. Practitioners are more likely to have an undergraduate degree and scientific background, followed by managerial background. Those in support roles are more likely to have a further education background and specialize in marketing.

Table 3 Employment & Educational Background of Technology Transfer Professionals (UK)			
Employment Background	Manager	Practitioner	Support Staff
Legal	13	14	3
Financial	12	13	12
Management	41	35	7
Scientific	41	47	12
Marketing	20	30	18
Policy	24	11	0
Training	14	17	8
Educational Background			
Tertiary and Further Education	7	11	37
Undergraduate Degree	28	42	19
Postgraduate Qualification	40	33	5
Professional Qualification	19	13	7
Source: Zeitlyn and Horne (2002)			

Contractual commitments and the employment timescale for knowledge transfer personnel tend to be long-term. According to a survey undertaken by AURIL (n= 314) (2005), 73% of knowledge transfer personnel are in full time positions, 17% work part-time and 10% work on an ad-hoc basis. 66% have permanent contracts, 33% fixed term contracts and 1% were seconded from other posts (AURIL 2005: 8-9). 56% of those sampled have worked in knowledge transfer for >4 years. 44% have been involved for <3 years, with 11% having <1 years experience. Knowledge transfer professionals tend to be quite young. 34% are in the 35-44 year old age bracket; 28% in the 45-54 age bracket, 26% in the 25-34 year old bracket. 11% are in the 55-65 year old age bracket (AURIL 2005).

The types of activities engaged in by knowledge transfer personnel are wide ranging. Again referring to AURIL data (2005), out-reach and partnership activities with external organizations comprise the major form of activity (73%). Commercialization management and support is the second most important activity (44%), followed by research administration/contract management (41%), project management (40%), Innovation/new ideas/new knowledge management (40%), intellectual property management (38%) and funding (34%) (AURIL 2005: 10)

4.2.2 UK Organizations Involved in Course Provision

Three organizations involved in training provision in the UK were located. These are:

- The Association of University Research and Industry Links (AURIL)
- PRAXIS Courses Ltd.
- Hawkesmere Plc.

Over recent years, AURIL and PRAXIS Courses Ltd. appear to have become the main providers of courses (see: Zeinyl and Horne (2002)). Hawkesmere Plc. is a private company providing a range of business relevant courses that span numerous fields.

Association of University Research and Industry Links (AURIL)

Established in 1995, the Association of University Research and Industry Links (AURIL) has gradually expanded its role into UI relevant training. As AURIL has taken on more responsibilities in this area, and on the basis of a survey undertaken with members that suggested there was demand for further training, AURIL has sought to structure the types of issues key to knowledge transfer personnel through the development of a Framework that outlines core knowledge transfer practices. This Framework is then linked to the courses that are provided.

The *CPD Framework for Knowledge Practitioners* (hereafter: CPD Framework) was developed drawing on research undertaken in 1999 and financially supported by the Department of Trade and Industry. The 2003 Framework is intended to assist in the construction of continued professional development for practitioners as means to develop occupational standards. This framework set out the key roles, learning units and types of knowledge that are seen as important for knowledge transfer professionals so that they can identify weaknesses and areas where additional training may be desirable (AURIL 2003: 9). The 2003 CPD Framework contents are presented in Appendix A.

AURIL has developed three types of course:

- The Professional Award for Knowledge Transfer
- The Postgraduate Certificate in Knowledge Transfer
- A Non-Assessed Portfolio

AURIL also provide one day or three day courses that cover particular themes, such as *Business Development* or *Negotiating Research Contracts*. In 2004, AURIL announced the establishment of the Institute of Knowledge Transfer which will provide training, professional development and qualifications. Current courses provided by AURIL will now be outlined. There are two main courses, and a range of one day and three day courses.

The two main courses are the *Professional Award in Knowledge Transfer* and the *Postgraduate Certificate in Knowledge Transfer*.

1. Professional Award in Knowledge Transfer

The Professional Award in Knowledge Transfer is a vocational award given on successful completion and assessment of a competence based review using the AURIL CPD Framework. This is a part-time course over a period of two years and is accredited by the Open University and the Qualifications and Curriculum Authority (QCA).

The programme aims to promote personal development and a range of inter-personal, intellectual and practical skills. Participants select areas of competence identified as necessary to enhance professional and personal development. An assessor then supports and guides candidates, helps candidates to gather relevant information, and provides feedback to the candidate.

2. Postgraduate Certificate in Knowledge Transfer

Beginning in 2004, AURIL and the Open University began a joint Postgraduate Certificate in Knowledge Transfer. The course has two modules: 1) Managing Knowledge, and, 2) a Work Based Project. Each course is worth 30 credits which may then be used towards a Master of Business Administration (MBA) qualification. Each course is estimated to take six months to complete. Core Units within the Certificate are:

1. An Introduction to Managing Knowledge
2. Managing Local Practice in a Global World
3. Communication, Learning and Sense-making
4. Managing Intangible Assets

5. Human Resource Dimensions of Innovation and Managing Knowledge

6. Managing Knowledge in Organizations

7. Managing Knowledge in Practice

8. Knowledge Technologies

9. Looking Ahead

The Work Based Project is developed on the basis of a training needs analysis where the candidate locates an area to develop new skills and knowledge in relation to an appropriate project. Assignment work is then completed on-line.

3. The Non-Assessed Portfolio and One Day Courses

A Non-Assessed Portfolio is also available and is accredited through the University Vocational Awards Council. The Non-Assessed Portfolio is the same as the assessed portfolio above, however this may be chosen as a stand-alone option for those that seek additional training without taking a full range of courses.

AURIL also operates a number of one day courses. These include:

- Business Masterclass (best practices in business development)
- Client Relationship Management (core principles of client relationship management)
- Personal Selling Skills Masterclass (tools and techniques for generating more business)
- Negotiating Industry-University Research Contracts
- Venturing with Intellectual Property
- Project Management Survival Guide

An example of the contents of the *Negotiating Industry-University Research Contracts* is presented in Box 2. This is an introductory course and is aimed at industrial R&D scientists, academic managers and administrators involved in industrial liaison. Most course components are provided by the former course provider for Cranfield R&D Centre, Richard Reeves, with courses complemented by involvement from other private sector companies.

Box 2 AUTM Course: Negotiating Industry-University Research Contracts[2]			
Day	Subject/Assignment	Person responsible	Business Sector
1	Organizational Structures of Universities and Companies Semi Autonomous units in Universities Interdependent activities in companies Parties involved in negotiation Motivations of the two organizations	Richard Reeves[3]	(formerly Cranfield University)
	Overview of Intellectual Property Patents, copyright, design rights How protection is secured Cost protection and patent timescales		
	Negotiation Exercise		
	Costing R&D Work Commercial overhead rates University overhead rates Differences between grants and contracts		
	Ownership of IP Employees whose job is to invent and others Students, academics and contractors		
	Organizing to negotiate Breaking the work up into tasks for teams Conventional procedures		
	R&D Agreements Licensing IP rights in an R&D contract Topics to include		
	Final Negotiation		

PRAXIS Courses Ltd.

Praxis was established with funding from the Department of Trade and Industry and the Cambridge-MIT Institute, from where it was a spin-out company. PRAXIS Courses Ltd. now provide professional development courses specifically for knowledge transfer. The Programme Committee is drawn from industry, universities, charities, and the health care sector and courses are developed by a volunteer committee. Courses occur on a regular basis and can run from 1 to 3 days. They cover five main areas:

- Fundamentals of Technology Transfer
- Creating Spin-out Companies
- Advanced Licensing Skills

[2] AURIL: Negotiating Industry-University Research Contracts, 22 September 2006 (Bristol).
[3] <http://www.richardreeves.net/index.htm>

- Research Contracts
- Business Development

The *Fundamentals of Technology Transfer Course* provides an overview of technology transfer issues and looks at basic aspects of: a) the legal issues of inventions, patents and copyright; b) negotiating and licensing; c) evaluating opportunities; d) marketing; e) managing relationships. This course is primarily aimed at new or recently recruited staff.

The *Creating Spin Out Companies* course covers: a) the writing of business plans and their use to raise finance; b) creating investment proposals; c) financial planning and strategy; d) legal issues including IP agreements; e) building an effective and sustainable management team.

Advanced Licensing Skills looks at how best to identify potential licensees, marketing and negotiation. This course is designed for professionals with significant experience.

Research Contracts looks at: a) the basics of contract law, b) full economic costing; c) intellectual property rights; d) drafting and negotiating contracts; e) use of model agreements; f) professional business practice. This course is primarily aimed at new or recently recruited staff.

The *Business Development* course focuses on the role of the business development manager in a university setting. The course covers: a) priorities and pressures: what are the objectives? What are the key challenges?; b) mechanisms and activities: ways of doing business with industry and commerce; c) generating new business; d) marketing communication tools: effective use of databases, publicity, trade shows, business clubs.

PRAXIS also provide one day courses that cover the following themes:

- Advanced Patents
- Business Negotiations
- Executive forum
- Finance for Technology Transfer
- Market Research
- Marketing
- Non-patent IP

An example of a one-day course, the *Fundamentals of Technology Transfer*, is presented in Box

3. This course is an introductory level course for those that are new to technology transfer. Courses are provided by personnel from universities, the pharmaceutical industry and the legal profession.

Box 3 Fundamentals of Technology Transfer (PRAXIS)[4]			
Day	**Course/Assignment**	**Delivery Organisations**	**Business Sector**
1	Evaluating Opportunities	Quester Cambridge Univ	Venture Capital Education
	Case Study Exercise	Quester Cambridge Univ	
	IP Primer: Patents	Mewburn Ellis	Legal
	Engaging Industry	Glaxosmithkline	Pharmaceuticals
	Marketing Technology	Royal Veterinary College	Education
	Case Study Exercise	KCL Enterprises	Education
2	Non-Patent IP	Dickinson Dees	Legal
	Anatomy of a License	Mills and Reeve	Legal
	Case Study Exercise	University College London	Education
3	Negotiation and Deal Making	University of East Anglia	Education

Hawkesmere Plc.

Hawkesmere Plc. is a private company that provides a range of courses spanning business and finance, specialist courses, and personnel management. Many of the tutors are from the legal profession or industry with less activity by university participants. There is also a stronger business focus than that in other courses which are specific to technology transfer. Particularly with regard to knowledge transfer and intellectual property management, Hawkesmere Plc. is involved in the following courses:

- Drafting and Enforcing R&D Contracts
- Drafting Intellectual Property Agreements
- Drafting Technology Licensing Agreements
- Intellectual Property and the In-House Lawyer
- International Intellectual Property Law

[4] PRAXIS: Fundamentals of Technology Transfer 12-15 September 2006 (London).

- International Technology Licensing Agreements
- The Ownership and Control of Intellectual Property Rights

In Box 4 an overview of the one day course, *Drafting Technology Licensing Agreements* is presented. This course is aimed at in-house lawyers, commercial and contract managers, business development managers, product managers, lawyers in private practice and licensing executives. Details regarding those involved in teaching were not available.

Box 4	**Hawkesmere Course: Drafting Technology Licensing Agreements**		
Day	Subject/Assignment	Organization	Business Sector
1	Introduction Main Commercial Terms Licence Grant Price and Payments Performance Obligations Important Legal Clauses Warranties and Liability Assignment and Change of Control Entire Agreement Clauses Termination and its consequences Drafting Exercises Preliminary Agreements and Documents Interpretation and Litigation Round up of Topical Legal Issues	Not Stated	Not Stated

Similar to courses provided by AURIL and PRAXIS, Hawkesmere Plc. courses also run over one or three days. Courses are authorized by the Law Society and there is possibility to accumulate Continuing Professional Development (CPD) hours. Courses are aimed at more senior levels, typically managers and executives, than AURIL or PRAXIS courses.

4.3 Japan

As we saw above, Japan is at a relatively early stage in the process of recruiting and training knowledge transfer staff due to the relatively recent introduction of policy measures allowing universities to exploit intellectual property. The issue of human resource development more generally can be seen as a policy priority in Japan, with its importance stressed in the recently adopted Third Science and Technology Basic Plan (covering 2006-2010) (CSTP 2006a: 29-30), Cabinet level assessment of the issue (CSTP 2006b) and a comprehensive strategic plan for

nurturing personnel with intellectual property skills (Cabinet Office 2006), all of which will be discussed at greater length below. Some of the problems regarding this issue relate to transferability between university TLOs and industry (Yamanoi et al. 2006) and over insufficient graduate-school opportunities for IP related courses (Arai 2005). In this section we will follow the structure of our previous country studies and outline the profile of staff in Japanese university licensing offices followed by an outline of the different courses available.

4.3.1 Profile of Japan's Technology Transfer Personnel

According to a recent NISTEP survey, in Japan there are on average 4.4 personnel per UI organization in the national universities (NISTEP 2005: 8). In terms of background, 62% of total staff are from universities with 27% from industry. 11% have legal backgrounds and15.5% have managerial or research backgrounds (NISTEP 2005: 11).

4.3.2 Organizations Involved in Course Provision

In the US and UK cases we began our discussion with the activities of the major representative body for technology transfer personnel in each country. In the Japanese context this is more difficult. Although representative organizations have begun to emerge, such as the University Technology Transfer Association of Japan (UNITT) established in 2004, the UNITT has not yet come to play a role equivalent to the AUTM or AURIL at this stage. This may occur in the future, as the remit of the organization extends to coverage of workshops and seminars aimed at developing human resources and disseminating information. At the moment, however, coverage within Japan is relatively dispersed. For this reason there are a greater number of organizations covered in our discussion of the Japanese case. We will begin our discussion with a review of the newly introduced Management of Technology (MOT) courses. From this we will look at courses provided by the Japan Intellectual Property Association (JIPA), the Japan Association of New Business Incubation Organizations (JANBO) before turning to other courses provided by universities. In particular we will look at Tohoku University, Tokyo University and Tokyo University of Science courses.

Management of Technology (MOT) Courses

Management of Technology Courses began to be introduced in 2002 by the Ministry of Economy, Trade and Industry following a report that outlined the importance of increasing the opportunities for professional level training across in Japan (METI 2001). An outline figure for the development of 10,000 trained professionals over a five year period was set out. Currently, there are around 148 institutions involved in MOT programmes, including universities, university consortiums, research institutions and the private sector. Many MOT providers also tie courses with legal associations such as the Japan Patent Attorneys Association, local Bar Associations and industry, which participate through consortium membership. METI and Keidanren are also involved.

With respect of MOT programmes for UI links, we will now turn to look at MOT Degree Courses, Non-Degree Courses and Other Types of Courses.

MOT Degree Courses

According to a METI document outlining the types of MOT courses available, there are currently 49 MOT degree programmes (2005a). These are two year full time programmes and the purpose of these courses is to train professionals to work in industry. As such the programme does not relate directly to technology transfer organizations. Of these 49 courses, a number are dedicated to entrepreneurship, or specialist areas of technology management such as engineering or medical fields.

One MOT programme operated by Yamaguchi University, for example, has introductory courses in *New Industry Creation and Project Management*, basic courses in *Theories of Economic Analysis*, *Theories of Intellectual Property*, *Marketing Strategies*, and *Financial Accounting Theories*. There are also practical lectures which include project management, business planning, and intellectual property strategy, amongst other courses. The programme is delivered by 12 faculty with a variety of experiences that span academia and industry. The MOT runs over two years.

Non-Degree Courses

From the METI document on MOT courses, 37 Non-Degree MOT courses were counted (2005a). These are delivered by a range of universities, research centres and private companies and can run over a number of months, or over a weekend. In reference to Table 4, Keio University operates a non-degree evening course in *New Business Creation*. Tokyo University's Research Center for Advanced Science and Technology (RCAST) provide an *Intellectual Property Management Course*. Toray Corporate Business Research Inc. provide a 17 week course on *Academia-Industry Cooperation Policy Managemen*t, which includes case studies of developments in UI relations, issues and challenges confronting Japan's innovation system, technology transfer and intellectual property rights, case studies and group practice. Hiroshima University also provide a monthly venture business oriented seminar.

Table 4 MOT Non-Degree Programmes Relevant to UI Links

University/ Organisation	Est.	Course Name	Target Audience	Main Content	Duration
Hokkaido University	2005	Venture Business Management Course	UG/PG/Prof	Management Skills, Financing, Business plans	3 Months
Hiroshima University	2005	Entrepreneur Training Programme	Those who wish to start their own company	Financial management, Business plans, Case Examples, legal issues	10 two-hour courses
Toray Corporate Business Research Inc.	NA	Academia Industry Cooperation Policy Management	Administrative personnel at Univ. & Ind.	Meta, object, methods, case studies, practice	6 Months
Tokyo University RCAST	2002	Intellectual Property Management School for Professionals	Business & Management Professionals	IP, IP businesses, ventures	4 Months
Japan Productivity Center for Socio-Economic Development	2005	Business Creation Course	Professionals from Industry	Business plans and business model assessment	9 Months
Keio University	2001	Intensive Weekend Seminars	Corporate Executives	Financial Management, Accounting, Management	Weekend

Kagoshima University	2004	Venture Business Laboratory Education Programme	PG Students/ Professionals	Business administration IP, psychology	Various
Source: METI, (2005b)					

Other MOT Programmes

Eighteen other MOT Courses were counted (METI 2005a), ranging from undergraduate and postgraduate general management courses, but also more specific courses that cover venture companies and start-ups (such as that by Tokyo Denki University), executive education programmes on marketing strategy, systems thinking and innovation management (Waseda University). There is some variety in terms of provision between these different courses with some delivered in the evenings, others delivered over the weekend or a longer period. No courses appear to relate specifically to knowledge transfer issues.

Japan Intellectual Property Association (JIPA)

The Japan Intellectual Property Association (JIPA) provide a range of courses in Tokyo, Kanto and Tokai. The main courses cover different levels of skill requirements. In particular:

- Entry Level Course
- Beginner Level Course
- Intermediate Level Course
- Advanced Level Course
- Research Course
- Leadership

The *Entry Level Course* covers: 1. Corporate Activities and the Intellectual Property Rights System; 2) Patents and practical use; 3) Design and Trademark System; 4) Foreign Patent Systems; 5) Intellectual Property Information; 6) IP Related Laws; 7) IP Contract Outline; 8) IP Management. The Course is delivered by lectures from universities, companies, and the legal profession and takes place over nine days.

The *Beginner Level Course* is for those that have completed the *Entry Level Course* or those with knowledge and experience of technology transfer. There are 8 components: 1) Patent Rights

and Practical Use Acquisition; 2) Foreign Patent Systems; 3) Design and Trademark System; 4) IP Information; 5) Primer in Law; 6) IP Legal Contention; 7) Corporate IP Management; 8) Civilized Society and IP. This course is delivered over 7 days by legal professionals, corporate representatives and IP related organizations.

The *Intermediate Level Course* includes: 1) Patent and Practical Use Law; 2) Design Law; 3) Trademark Law; 4) the American Patent System; 5) the European Patent System; 6) Treaties and Asian Country Patent Systems; 7) Basis of Contracts and Practical Business; 8) Outline of Corporate Law; 9) Civil Law Outline; 10) Ways of writing detailed statements (Chemicals, electronics/machinery); 11) Patent Information and Patent Investigation (chemicals, electronics/machinery); 12） Constructing and Managing Patent Information Systems; 13) Competition Law; 14) Copyright Law.

The *Advanced Level Course* includes: 1) Patent Office Decision Litigation; 2) Trademark Competition Law and Foreign Country Systems; 3) Comparative Patent Law; 4) International Contracts; 5) Patent Infringement Litigation; 6) American Patent Litigation.

The *Research Course* includes: 1) Researching Judicial Decisions; 2) Research on Patent Precedents; 3) How to write an application in English (Chemistry; Electronics/Software; Machinery).

There is also a comprehensive course and courses dealing with foreign affairs, a *Special Course on Knowledge Change Leadership*, and various temporary courses which cover contemporary issues, such as patent law reform in the US or intellectual property lectures for technologists (JIPA 2006).

Japan Association of New Business Incubation Organizations (JANBO)

The Japan Association of New Business Incubation Organizations (JANBO), which was established in 1999 provides eight courses for those with different levels of experience. These courses are specific to those involved in managing or implementing incubation facilities or incubation firms. These courses are:

1. Incubation Manager (Induction Course)

2. Business Incubation (Foundation Seminar)
3. Business Incubation (Planning and Management)
4. Overseas Business Incubation
5. Country Wide Incubation Manager Workshop
6. Incubation Manager Practical Ability Training (Leadership)
7. Incubation Manger Practical Ability (Instructor Training)
8. Business Incubation Step Up Programme

Courses are delivered in various locations throughout Japan and are typically run over half a day. In the courses participants will firstly introduce themselves, have the workshop theme explained. There is then a discussion surrounding each theme, followed by time for questions and answers.

4.3.3 University Delivered Courses

A study by Inoue (2004) found that there were 10 programmes related to intellectual property management provided by universities[5]. Excluding those universities that only provide undergraduate tuition, an overview of courses is presented in Table 5.

Table 5 Japanese University Provision of Knowledge Transfer Courses

University	Est.	Delivery	Course Name	Type of Award/s	Duration
Osaka Institute of Technology Graduate School	2003		Intellectual Property Specialist Course	Master	2 years
Kanazawa Institute of Technology	2004	Evenings, weekends	Knowledge Transfer Professional Course	Master	1 Year
Kyoto University	2005	Full Time	Management of Technology in Medical Science	Master	2 Years

[5] 1) Osaka Institute of Technology and 2) Osaka Institute of Technology Graduate School; 3) Kanazawa Institute of Technology; 4) Kibi International University; 5) Kyoto University; 6) National Graduate Research Institute for Policy Studies; 7) Tohoku University; 8) Tokyo University; 9) Hitotsubashi University; 10) Tokyo Institute of Technology.

National Graduate Research Institute for Policy Studies	2004	Full Time	Intellectual Property Programme	Masters/Doctoral	
Tohoku University	2004	Evenings	Intellectual Property Creation Extension School		2 Months
Tokyo University	2002	Evenings	Intellectual Property Personnel Training Programme		5 Months
Tokyo Institute of Technology	2003	Full Time	Intellectual Property Management Programme	Masters	2 Years
Tokyo University of Science	2005	Full Time	Master of Intellectual Property	Master	2 Years

We will draw on this table further below when we will outline the courses provided by Tokyo University, Tohoku University Extension School and Tokyo University of Science.

Tokyo University: Technology Liaison Fellow (TLF) Programme

From 2000, the Centre for Collaborative Research (CCR) at the University of Tokyo began the *Technology Liaison Fellow Programme* to train technology managers in technology transfer and university-industry collaboration. Trainees are sent by local government for a period of one year. No fees are payable. Those employed in corporations are not eligible to participate in the programme. As of 2005, this course has provided training for 38 technology managers from Japanese local government over the five years of operation. The TLF programme is delivered through 100 lectures over the academic year and covers the following themes:

- On the job training

  This covers technological surveys and locating potential areas for joint research with industry; using CCR database system and liaison activities. For liaison activities, trainees cooperate with a professor and assist in making joint research run smoothly.

- Lectures

Lectures cover: 1) knowledge related to UI links which includes trends and policies in UI collaboration, university systems, related laws, intellectual property such as patents/technology transfer/start-up companies/research and development in companies. 2) Knowledge related to advanced technologies, which covers advanced technologies currently under development in the university; technology developments in companies. Lectures can cover a range of themes such as 'Start-up companies and their support' or 'patent law'.

- Study tours and participation in meetings

  This includes visiting organizations, exhibitions, and participating in academic conferences, lectures and seminars.

- Collection and management of Information

  This includes collecting information related to UI information from newspapers, books and the internet; the storage of such materials in databases and the purchase and management of necessary information materials.

Tohoku University Extension School

The Extension School operated by Tohoku University was established in 2002 and is delivered from the Tohoku University Office in the centre of Tokyo. There are two courses:

- Advanced Intellectual Property Management
- Practical Intellectual Property Training Course.

The *Advanced Intellectual Property Management Course* is for those involved in corporate R&D activity management, IP management, technology management and product development. There is one course a week during the evenings and the course runs for 2 months. Key components of the course are: 1) Management and Technology Strategy; 2) Basic Thinking about Strategy; 3) Technology Strategy; 4) R&D Strategy and Organisational Reconstruction; 5) Companies and organizational R&D Reform Strategy; 6) Innovative Product Management and University-Industry Link Management (1); 7) Innovative Product Management and University-Industry Link Management (2); 8) Corporate Management Strategy and IP strategic Marketing; 9) IP and Risk Management Theory; 10) IP Management and Risk Management; Patenting; 11) Common Law and Risk Management; 12) Introduction to Chinese IP.

The *Practical Intellectual Property Training Course* is for corporate researchers involved in R&D activities. The course covers patent form completion training, American Intellectual Property Law, lectures in English, and training through contact with a business leader. This course also operates in the evenings once a week. The course is provided by legal professionals, university professors and consultancy firms. The 12 courses cover the following issues: 1) Management Strategies and Intellectual Property Strategies; 2) Patent Claim Training (how to write a patent); 3) Patent Claim Training (scope of patents); 4) Patent Claim Training (claiming for infringement); 5) Patent Claim Training (process of claiming); 6) Patent Claim Training (software, business model patents); 7) Claim presentation and contest; 8) Employee invention rights; 9) American Contract Law; 10) American Contract Law; 11) American Intellectual Property Right Litigation (CAFC and patent strategies); 12) American Intellectual Property Right Litigation (Tohoku University 2006).

Tokyo University of Science: Master of Intellectual Property (MIP) Programme

The private university, Tokyo University of Science (TUS), operates an MOT programme and from 2005 established the Master of Intellectual Property (MIP) programme. This is worthy of note principally for the diversity of courses provided. The Two Year Masters course is structured around three core courses covering Civil Law, Japanese Civil Proceedings Law, and Intellectual Property Law. Students then select from 60 courses for their particular learning objectives. For instance, those that work in or seek to work in the electronic manufacturing sector will sit the core courses outlined above and take a range of courses that can cover *IP Management within the Firm; Standardization Strategies, American* or *Chinese Patent Procedures.* Those that wish to work in TLOs and technology transfer will take the core courses and then courses that can include *Evaluating IP, Technology Transfer, Drafting IP Contracts, IP Negotiation, US Patent Law.* The Faculty involved in providing courses are drawn from industry and academia. There is also participation by visiting professors who are prominent in technology transfer in Japan.

Amongst the range of courses available, TUS coverage is that which most resembles provision in the USA and UK, as exemplified in Table 6 where courses in *IP Policy*, *Competition Policy and IP*, *IP Accountancy*, *Technology Strategy*, *Venture Business Establishment Theory*. Courses are

also available that introduce key technologies such as *IT and Electronics*, *Environmental Technologies*, *Bio-Technologies,* and *Nanotechnology* are presented. The MIP programme is delivered through full time tuition over two years, and has students drawn from a broad range of educational backgrounds and ages.

Table 6 Example Courses Covered by Tokyo University of Science MIP Programme		
IP Policy	Competition Policy and IP	R&D Strategy
Design Strategy	IP Evaluation	IP Accounting
IP Negotiation	Technology Transfer	Venture Business Establishment Theory

5. Comparison of Course Provision and Delivery in the USA, UK and Japan

In this section a comparative overview of course provision in the three countries will be developed. Issues surrounding personnel, qualifications, course levels, delivery, course content, and costs will be discussed.

In terms of personnel, the US and UK have a broadly similar number of staff involved in technology transfer, 1,649.9 (USA) to +/-1200 in the UK. This is in spite of the relative differences in the number of universities and the sizes of the different innovation systems. Consequently, the number of staff per institution is significantly higher in the UK (13 staff per institution) (Zeitlyn and Horne 2002: 8) than that in the USA (4.3) (AUTM 2005) and Japan (4.4) (NISTEP 2005).

In Table 7, the different types of qualification, courses, areas of coverage and types of delivery are outlined. Both the USA and Japan have MOT courses that can be used towards the attainment of an academic award, but as we saw in Japan few of these courses directly relate to technology transfer issues. Both the UK and US have the concept of accumulating hours of continued professional development as part of their technology transfer course provision. In the US the academic dimension appears to be less important, with greater emphasis placed on professional level courses that seek to provide key skills.

Looking at levels of experience in technology transfer, the US has the more comprehensive

range of courses, which span leadership levels to those in support roles. Training in the UK appears to be more narrowly focused to the experienced/mid career and new entrant levels of personnel. Courses for those in support positions or leaders of technology transfer organizations were difficult to locate. Japan, principally through the JIPA, has course provision across a range of levels. Training for those in support roles or those in charge of licensing or outreach offices could not be located.

With regard to course contents, these follow broadly similar themes, especially in the USA and UK where courses covering technology transfer, start-up development or licensing are to be found. There are also courses that extend to career development, negotiation techniques, leadership, business planning and marketing that appear to link well with the multifaceted nature of the technology transfer business. Japan, by contrast, with the exception of the MIP programme provided by TUS, has a relatively limited range of courses that relate principally to licensing. The MOT courses do add greater diversity to the range of possible courses, but these are targeted predominantly at the business community rather than directly at the needs of the technology transfer community. There are also few courses that relate training to other topics such as negotiation techniques, business plan development, financing for startups or aspects of professional support that relate to career advice.

Table 7 Comparative Overview: Course Provision in the Three Countries				
		UK	US	Japan
Qualifications	Academic	●		●
	Professional	●	●	●
	Non-Accredited	●	●	●
Course Provision at Different Levels	Leadership	●	●	●
	Experienced/Mid Career	●	●	●
	New Entrants	●	●	●
	Support Staff		●	
Coverage of Key Areas	Licensing	●	●	●
	Spin-Offs	●	●	●
	Intellectual Property	●	●	●
	Contracts	●	●	●
	Marketing	●	●	●
	Software	●	●	
	Finance	●	●	●
	Negotiation	●	●	●
	Leadership	●	●	●
	Business Development	●	●	●
Delivery	Evenings	●	●	●
	On Line	●		
	1Day	●	●	●
	3 Day	●	●	●
	Monthly Period	●	●	●

In terms of course delivery, the UK appears to provide the most opportunities for learning of the processes of technology transfer with evening courses, online learning, one-day, three-day and other types of courses. Courses are also provided in different parts of the UK. In the US context the AUTM Annual Meeting is the major vehicle for further training and the provision of learning opportunities. The AUTM also regularly hosts courses in different parts of America. By contrast, Japan has yet to develop a prominent provider of education and courses for UI related staff. The MOT courses are the most prominent vehicle, but these do not relate directly to technology transfer and provision in Japan appears to be quite fragmented. There are also issues surrounding flexibility of delivery and there appears to be few opportunities for 1 day, 3 day or other types of brief intensive course specifically relating to knowledge transfer issues, although JANBO provides such courses relating to incubation issues.

With regard to the types of organizations involved in course delivery, these tend to be either professional non-profit associations where there is typically a core membership on which to draw,

as in the case of the AUTM, AURIL, Technology Transfer Society, or JIPA. PRAXIS in the UK case is relatively unique in being a company providing courses solely relating to technology transfer. Corporate involvement was seen in the case of Hawkesmere Plc. and some of the MOT providers, such as Toray Corporate Business Research.

Looking at the cost basis for the different courses using US Dollar PPPs (2006) (Table 8), the costs of one day courses in the UK tend to be cheaper than those in the USA. Likewise, three day courses also tend to be cheaper except where there is private provision. Courses in Japan are cheaper than those in the UK and USA, and in many cases are free. MOT provision is different in this respect, with courses provided by Keio University costing $1004. Other MOT courses are similarly expensive (METI 2005a). These differences in price, particularly when looking at the USA and UK may reflect the availability of subsidies to support training programmes.

Table 8 Course Costs in the Three Countries			
United Kingdom*			
Agency	**Programme**	**Duration**	**Cost (US$ PPP2006)**
AURIL	Professional Award	2 Yrs (P/T)	933
	Postgraduate Certificate in Knowledge Transfer		1554
	Non-Assessed Portfolio		186
	Eg. Negotiating Industry-University Research Contracts	1 Day	171 Member 183 Non-Member
Praxis (Cambridge-MIT Institute)	**Three Day Courses:**	3 Days	
	- Fundamentals of Technology Transfer		339 Subsidized 494 Standard
	- Research Contracts		
	- Advanced Licensing Skills		401 Subsidized 494 Standard
	One Day Course :	1 Day	
	- Negotiation Masterclass		140 Subsidized 140 Standard
	- Finance Masterclass		
Hawkesmere Plc[6]	E.g. Drafting and Enforcing R&D Contracts	1 Day	404
	International Intellectual Property Law	3 Day	994
United States			
AUTM[7]	Annual Meeting	3 Day	Not Available
	Basic Licensing Course	1 Day	575 Member 775 Non-Member
	Tools Course	3 Days	575 Member 775 Non-Member
	Start-Up Business Development	3 Days	650 Member 975 Non-Member
	Executive Forum	2 Days	795 Member 995 Non-Member
Technology Transfer Society	Technology Transfer: Issues and Processes	2 Months	355
LES	Fundamental Intellectual Asset Management	3.5 days	1250 Members
Japan			
Hiroshima Univ.	Entrepreneur Training Programme (MOT Non-Degree)	10 Weeks	Free
Keio Univ.	Intensive Weekend Seminars (MOT Non Degree course)	2 Days	1004
Tohoku University	Extension School	3 Months	Free
JIPA	One Course	Various	269
	One Course	2 Day	173
Tokyo University	TLF Programme	1 Year	Free
* Excluding Value Added Tax (17.5%)			

6. Implications of the Study

Here we will discuss the policy implications of our study for Japan. We will first discuss the relationship between the topics covered in this paper and current policy frameworks. We follow this with discussion of issues surrounding the rationale for promoting further training courses. We then discuss the means by which course delivery could proceed, before turning to some tentative policy recommendations.

Relationship to Current Policy

Following the introduction of the *Science and Technology Basic Law* in 1995 (Law 130) funding from the *Third Science and Technology Basic Plan* has increased to $200 Billion over 2006 to 2010 (1% of GDP per year, of which the nominal growth rate is 3.5%). This funding has been matched by the introduction of measures to exploit this investment such as the *Technology Transfer Law* (1998: Law 52), the *Industry Revitalization Special Measures Law* (1999) and the *Basic Law on Intellectual Property* (2002: Law 122). These initiatives have been combined with various strategies relevant to personnel issues. Chapter Five of the *Plan for Promoting Intellectual Property* (2003) stresses the importance of promoting intellectual property personnel, the MOT programme and relevant IP related tuition in universities. The *New Economic Growth Strategy* by METI (2006) has called for a more flexible and diverse educational system, and the development of wider opportunities for training and education. More recently, the *Comprehensive Strategy for Personnel with Intellectual Property Skills* (Hereon: *Comprehensive Strategy*) published by the Cabinet Office in January 2006 has developed three relevant objectives. These cover: 1) increasing the number and quality of those involved with intellectual property; 2) nurturing and enhancing the quality of IP management; and, 3) raising consciousness surrounding IP issues amongst the general population (Cabinet Office 2006:8). The *Comprehensive Strategy* is to be implemented in three phases. In the first phase (2005-7) problems in provision, facilities and the environment will be resolved and provision for training and education expanded. The second phase (2008-11) will see the expansion in the number of personnel. By the third phase (2012-2014) staff with sufficient experience and training will be in

place to assist Japanese international competitiveness (2006: 10-11).

The *Comprehensive Strategy* has 10 key policy points which cover: 1) The creation of a special council (*Kyōgikai)* for promoting and developing personnel skills in relation to intellectual property. This special council should concern itself with tuition and training issues, collect information, address relevant issues and set out strategic plans. 2) The support of training programmes and research on intellectual property. This covers education from high school to the postdoctoral level. Here, recommendations for what government should do cover the support of post-graduate education and the opportunities for those with technological backgrounds to undertake re-training and the development of special training projects at legal and specialist schools. 3) The induction and use of personnel with understanding of advanced technologies. 4) The use of personnel with experience of administration. 5) The establishment and amalgamation of career paths for those involved in intellectual property. 6) Promotion and Interchange with overseas; 7) Strengthening of IP related networks either through the existing UI Database operated by the JST and current networks; 8) Use and support of conferences; 9) The development of training and educational tools; 10) Private qualifications for intellectual property.

Relationship to Key Issues in Japan

Here we will suggest that two issues should be considered. These are: 1) the return on investment in R&D expenditures; 2) universities enhancing their proportion of external income.

Considering the scale of investment following the Basic Plans, there appear to be issues surrounding the return on this investment. While it may be too early to judge the effect of investments in science and technology overall, data appears to suggest that the return has so far been quite weak. The Annual Report on the Japanese Economy and Public Finance published by the Cabinet Office (2005) suggested that the effectiveness of budget use was lower than that elsewhere. A second analysis performed by the OECD found that the level of results was quite low (OECD 2005). While there are complex factors surrounding these issues, improvements in the frequency and intensity of links between universities and industry could be of some importance. This is certainly the tenor of a recent innovation policy assessment by the CSTP, which called for a strengthening of UI links (CSTP 2006c).

While indicators suggest that there have been continuous upward increases in cases of UI collaborative and contract research (NISTEP 2005), there is still scope to argue that links between universities and industry could be closer. For example, HERD funding from industry in universities is comparatively low at 2.8% (2004) in comparison to the UK (5.5% (2003)) and the USA (5% (2004)) (OECD 2006). A partial explanation for this low figure could possibly rest on factors related to university strategies for UI activity, with attention directed predominantly towards licensing activity. By contrast, research in the USA (Agrawal and Henderson 2001) and in the UK (HEFCE 2006) has shown that licensing forms only a small dimension of UI relations and that, particularly in the UK context, most industrial funding arises through (in order of magnitude) contract research, courses and training, consultancy, facilities and equipment use, and finally, IP exploitation (HEFCE 2006: 11). Many licensing offices in Japan are not currently profitable (METI 2005b) which may also suggest the importance of alternative financial strategies.

Some research, however, has suggested that many technologies and ideas flow between industry and universities without the use of an intermediary (Colyvas et al. 2002). The Japanese case, which has traditionally operated along more informal lines, provides an interesting study in how more formal approaches to UI relations may influence informal ties. Survey results from firms have suggested that there was some desire for codification of relationships and use of appropriate infrastructures (MEXT 2002). Furthermore, a small body of literature has suggested that in the US context the capabilities of knowledge transfer staff can be of importance in shaping institutional UI performance (Siegel et al. 2003; Thursby and Kemp 2002). Chapple et al. (2005) in their comparative analysis of the efficiencies of licensing offices specifically came to the conclusion that upgrading skills and capabilities of UK technology transfer staff would be of benefit. This might suggest that where policies and procedures are in place at universities, the influence and importance of staff charged with implementing such regulations gains importance. Japanese UI links are now organized through these structures as, following the incorporation of the national universities in 2004, many universities moved to adopt formal IP policies and UI strategies. Regarding the central issue of whether training actually works, a pressing area for future research could be to assess the importance of training vis-à-vis a control group that has not

received training to measure the overall influence that this may have on institutional UI performance.

Issues Relating to Course Delivery

We have seen that the *Comprehensive Strategy* (Cabinet Office 2006) has outlined the use of special committees, greater engagement by industry, stronger networks (such as the *Sangakukan Renkei Shisai Database* operated by the Japan Science and Technology Agency (JST)), and the creation of a special committee. The crux of these proposals rest principally with IP issues, rather than dealing directly with UI issues. Our comparative review suggests that a **core organization**, similar to the AUTM, or AURIL that is able to support, maintain and outline information, provide manuals and act as a hub for those in the technology transfer community could be of benefit.

There are benefits of using such an organizational form. The first relates to proximity to developments in the field and knowledge of the demands and requirements of members. Secondly, there is a known community whereby it is easy to maintain on-going information and support. Thirdly, membership fees may possibly be used to cross subsidize courses or conferences. Fourth, a representative organization may overcome the possibilities of duplication. Issues, however, relate to the prominence and profile of such organizations in Japan; whether there is the capacity to develop such courses; and whether a more diverse range of organizations actually provide a healthier learning environment for UI transfer professionals.

Fitting technology transfer courses into the range of courses offered under the **MOT programme** could be a further option. In particular, there is an MOT Consortium which sees engagement between business, universities and government. This could be a building block for developing courses targeted specifically to knowledge transfer and would allow for co-ordination and regional factors to be considered in relation to delivery. Courses specific to knowledge transfer could be placed in the same mode as Non-Degree MOT courses. There are some benefits to this approach. First, MOT courses have already gained some recognition and status and therefore new programmes specific to technology transfer could easily capitalize on this reputation. Second, fitting technology transfer specific courses within the MOT programme

would ensure greater coherence in delivery and avoid the development of too many qualifications or ports that provide different courses and training. We saw that AURIL courses in the UK could be used as credits towards an MBA, and a similar system could be adopted for technology transfer courses in relation to MOT related qualifications.

A further option could be delivery by **private companies**. We saw that some companies are already involved in MOT course provision. Yet, if market demand was there, then surely technology transfer courses would already have begun to be provided by more companies? Issues here may relate, as with the UK, to the scope of demand or the existence or non-existence of budgets within the universities to send staff on external training. Should companies come to play a larger part in provision, one factor which may limit training opportunities would be the costs involved for university TLO staff. There may also be issues concerning regional provision, where demand does not adequately justify course provision. A further issue may also be that demand across a range of different expertise levels may be insufficient to motivate companies to develop a sufficiently wide range of different courses.

Universities are currently the main suppliers of technology transfer courses in Japan. The benefits of universities vis-à-vis the other options would be that it is relatively cheap to implement, current funding schemes can be accessed to subsidize the schemes (as with Tohoku University above) and there are already centres that have acquired recognition in this area. Problems with existing delivery relates to the limited geographical dispersal of such courses. Universities will also need to heed the overall practical nature of many of such courses. A further possibility would be for a university to spin-out course provision in a manner similar to Praxis, in the UK. This could then draw on existing strengths and experience and provide courses across a range of different regions. Again, the viability of such a venture would rest on the level of demand for further training amongst the technology transfer community.

Provisional Recommendations

Here we will develop some provisional recommendations based on this study. We would first like to emphasize that further research (discussed below) should ideally clarify the demand for further training and satisfaction with current provision.

Some initial ideas for further consideration could be as follows:

1. The current *Comprehensive Strategy* could place greater consideration on wider issues beyond licensing and incorporate elements relevant to technology transfer.
2. Greater consideration could be given to assessing the feasibility of developing and enhancing the activities of a core organization.
3. Greater consideration could be given to enhancing course provision across a range of levels and for different levels of experience.
4. Ensuring that there is sufficient flexibility in course provision either through widening opportunities for one-day/three day/evening or on-line courses.
5. Ensuring that there are sufficient training opportunities at the regional level.
6. Exploring the possibility of funding to partially subsidize courses that may otherwise be too expensive.

7. Issues for Further Research

Clearly there are many unknowns about courses for technology transfer in Japan. In particular, further work is required for understanding the general profile of the technology transfer community, the types of skills required and the institutional basis for supporting further training. Specifically, future research should focus upon:

- Gathering a more accurate profile of knowledge transfer personnel in terms of current skill levels, qualifications and professional experience; employment structure (length and nature of contracts); and disciplinary background.
- Outlining what sort of skills are necessary, what are felt to be the current gaps, and which types of skills/qualifications would be beneficial or desirable.
- Reviewing the levels of demand for training and the location of current barriers that may exist. For instance, lack of institutional financing, lack of opportunities, lack of courses, inflexibility in employment contracts.
- Assessing the most appropriate means of course delivery. For instance, whether there is

demand for traditional classroom oriented tuition, annual meetings, or on-line distance oriented learning.

- A further issue that could be addressed by the academic community is in seeking to measure how training may affect performance within licensing organizations.

8. Conclusion

This report has compared training programmes for developing UI personnel in the USA, UK and Japan to contribute to ongoing discussion in the Japanese policy environment surrounding human resource related issues and UI links. The report has not sought to be a comprehensive assessment of the full range of UI relevant courses in each country, but merely to review the main types of training activities that are occurring.

In respect of the USA, the AUTM plays a key role in providing information, manuals, scholarships, an annual meeting and a number of courses delivered on annual and bi-annual periods. The AUTM Annual Meeting is a major event for educational and networking purposes and in this report we reviewed the types of educational tracks and the organizations that participate in providing tuition. Courses at the Annual Meeting range from methods for technology valuation, marketing strategies, academic studies of technology transfer and equity based licensing. Courses are provided by personnel from universities, business and specialist research institutes. There is also an international dimension to proceedings, with participants from a range of countries. The Licensing Executive Society provide two main courses one of which is a two day professional course and a second which targets professional development across three levels: basic, intermediate and advanced. Similar to AUTM, LES courses are delivered on a regional basis. The Technology Transfer Society courses appeared more ad-hoc than those provided by the AUTM and LES, but allowed us to observe how regionally based courses have been delivered.

We then looked at provision in the UK. Here, AURIL appears to be modeling itself on the AUTM and performs similar roles such as the provision of information and support. AURIL is increasingly active in training for technology transfer personnel both through courses, and through establishing a dedicated centre for UI personnel training. Additional AURIL courses range from 1 to 3 days and there are options for students to tailor courses to their own particular

needs. Unlike the US case, AURIL has sought to structure courses through a *CPD Framework* which also serves as a base to measure skills. PRAXIS, which is unique in being a stand alone organization without membership that is solely dedicated to UI related courses, also provide 1 or 3 day courses covering introductory levels and those that are more advanced. The Hawkesmere Plc. courses appear to be more specialized, and have a stronger business orientation. As with the US, courses are delivered throughout different regions of the UK and there appears to be a large degree of flexibility in provision, particularly through use of on-line learning.

There is a discernable difference for Japan. Provision is distributed quite broadly across a range of institutions with no organization playing a key role similar to that of AUTM or AURIL. Courses are provided by specialist bodies or universities. In reference to the contents of these courses, we observed that there has been a tendency to focus mostly upon intellectual property issues, with opportunities to learn about financing start-ups, research contracts, or marketing somewhat limited by comparison to the USA and UK. The existence of MOT programmes and courses by JANBO do provide wider diversity, but the MOT programme has been largely targeted to industry needs. The MIP course by Tokyo University of Science has the most diverse range of courses and provision here is most similar to that in the other countries; however, this programme is a full time Masters degree so may lack some of the flexibility of delivery in comparison to similar courses elsewhere.

We then linked our comparative study to current policy developments in Japan. While there has been much policy activity over recent years, we noted in particular the *Comprehensive Strategy for Personnel with Intellectual Property Skills* which has set out a programme of reforms over the 2005 to 2014 period. This strategy in particular has highlighted the need for greater attention to be given to personnel surrounding IP; but is also concerned with institutional elements of provision. Drawing on this recent policy activity we then looked at why the development of wider course provision may be of use. Our argument rested on seeking to strengthen UI performance within current formal UI linkage arrangements and to possibly expand the diversity of industrial funding. Based on our comparative discussion we then outlined how courses could be delivered. We noted that there may be some desirability with a core organization similar to AUTM or AURIL. It should be added that without further research it is

difficult to proceed in developing detailed policy outlines due to uncertainty over levels of demand for UI course provision, budgetary scope and types of issues necessary for coverage. This will be pursued as the next step in our review of training issues for personnel involved in UI links.

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