



Technology Development Strategy

Report to the Language Technologies Research Centre

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0.1. DEVELOPMENT STRATEGY AND TARGETS

0.1.1. Overview

THE TASK OF DETERMINING A DEVELOPMENT STRATEGY IS THUS DESCRIBES BY INDUSTRY CANADA:

THE PARTICIPANTS NEED TO IDENTIFY THE OVERRIDING CONSIDERATIONS IN CHOOSING BETWEEN TECHNOLOGIES FOR FUTURE APPLICATION. THESE ARE THE TECHNOLOGY DRIVERS—THEY WILL DRIVE THE DECISION-MAKING AS TO WHICH TECHNOLOGIES TO PURSUE. FOR EXAMPLE, DRIVERS MIGHT INCLUDE THE AVAILABILITY AND COST OF MATERIALS AND ENERGY FOR A MANUFACTURING PROCESS, OR THE ENVIRONMENTAL IMPACTS OF THE PRODUCT OR ITS MANUFACTURING PROCESSES.

THE PARTICIPANTS SET A TARGET FOR EACH TECHNOLOGY DRIVER. THESE TARGETS ARE SET IN REFERENCE TO THE CRITICAL ATTRIBUTES THE FINAL PRODUCT OR TECHNOLOGY MUST POSSESS. IN OTHER WORDS, THE TARGETS MUST BE SET TO DELIVER THE DESIRED END SYSTEM. HERE IS AN EXAMPLE. FOR A PARTICULAR INDUSTRY, THE USE OF FOSSIL FUELS IS AN ISSUE AND IS EXPECTED TO INCREASE IN IMPORTANCE. THUS, ONE DRIVER IS THE ENVIRONMENTAL IMPACTS OF FOSSIL FUELS. AFTER DELIBERATIONS, THE PARTICIPANTS SET THE TARGET FOR THIS DRIVER—TO REDUCE FOSSIL-FUEL CONSUMPTION BY HALF BY 2010, WHILE MAINTAINING CURRENT PERFORMANCE, THROUGH SUBSTITUTION OF NON-POLLUTING RENEWABLE ENERGY SOURCES.¹

THE FOLLOWING SUB-SECTIONS INCLUDE VARIOUS DEVELOPMENT STRATEGY CONSIDERATIONS PROVIDED BY THE DIFFERENT SUB-COMMITTEES, AS WELL AS A BROAD DISCUSSION CONCERNING THE LANGUAGE INDUSTRY AS A WHOLE. THE MAIN GOAL OF THIS SECTION IS TO IDENTIFY OVERARCHING CONSIDERATIONS APPLICABLE TO ALL SUB-SECTORS, IN ORDER TO WORK OUT A COMMON DEVELOPMENT STRATEGY. IN THIS VIEW, AND IN CONSIDERATION OF THE DIFFERENT TECHNOLOGICAL NATURE AND CHARACTERISTICS OF THE SUB-SECTORS, THE FOCUS IS NOT SO MUCH LIMITED TO STRICTLY TECHNOLOGICAL CONSIDERATIONS, WHICH REMAIN LARGELY SPECIFIC TO EACH SUB-SECTOR, AS IT IS BROADENED TO MORE GENERAL STRATEGIC CONSIDERATIONS APPLICABLE TO ALL SUB-SECTORS, INCLUDING DEVELOPMENT SUPPORT STRATEGY CONSIDERATIONS AND INITIATIVES FOR THE PROMOTION OF THE LANGUAGE-INDUSTRY.

FROM THIS PERSPECTIVE, A USEFUL STARTING POINT IS THE ANALYSIS OF THE PRESENT STATE OF THE LANGUAGE INDUSTRY CONTAINED IN THE ACTION PLAN FOR OFFICIAL LANGUAGES, AND THE PLAN CORRESPONDINGLY LAID OUT BY THE GOVERNMENT. ACCORDING TO THE ACTION PLAN, THE LANGUAGE INDUSTRIES ARE FACING FOUR MAIN CHALLENGES:

1. INDUSTRY FRAGMENTATION

THE EXPLOSION OF LANGUAGE OCCUPATIONS HAS GIVEN RISE TO A PROLIFERATION OF MICROBUSINESSES ONLY NOW BEGINNING TO CONSOLIDATE THEIR EFFORTS. INDUSTRY CANADA ESTIMATES THAT THE 15,000 PEOPLE IN THE LANGUAGE INDUSTRIES ARE SELF-EMPLOYED OR WORK FOR COMPANIES THAT EMPLOY A HANDFUL OF SPECIALISTS. MOST TRANSLATORS (83%) ARE SELF-EMPLOYED OR WORK IN MICROBUSINESSES WITH ANNUAL REVENUES UNDER \$500,000.

¹ *PRODUCING A TECHNOLOGY ROADMAP* (ACCESSED ON OCT. 31, 2005 AT [HTTP://STRATEGIS.IC.GC.CA/EPIC/INTERNET/INTRM-CRT.NSF/EN/RM00060E.HTML](http://strategis.ic.gc.ca/epic/internet/intrm-crt.nsf/en/rm00060e.html), SECTION 2, *DEVELOPMENT OF THE TECHNOLOGY ROADMAP*, SUBSECTION *SPECIFY THE TECHNOLOGY DRIVERS AND THEIR TARGETS*.

THERE ARE VERY FEW LARGE COMPANIES AND COLLABORATION BETWEEN THEM IS MINIMAL. ALTHOUGH SOME ORGANIZATIONS HAVE BEEN FORMED, NO ONE GROUP REPRESENTS ALL OF THE BUSINESSES. AS A RESULT, LANGUAGE INDUSTRY PRODUCTS AND SERVICES ARE NEGOTIATED SEPARATELY, IN RELATIVELY MODEST PORTIONS. THE PARTNERSHIPS THAT WOULD NORMALLY BE HELPING TO STRENGTHEN THE INDUSTRY ARE FAILING TO DO SO. IN MAY 2002, INDUSTRY CANADA'S CONSULTATIONS ON CANADA'S INNOVATION STRATEGY BROUGHT TOGETHER A NUMBER OF PROFESSIONALS AT A SYMPOSIUM ON LANGUAGE INDUSTRIES. THE PARTICIPANTS MENTIONED THIS FRAGMENTATION AS ONE OF THE DIFFICULTIES FACED BY THEIR INDUSTRY.

2. LACK OF VISIBILITY

THE CANADIAN LANGUAGE INDUSTRIES ARE LARGELY UNRECOGNIZED, BOTH HERE AND ABROAD. THEIR REDUCED VISIBILITY IN THE EYES OF THE CANADIAN PUBLIC EXPLAINS IN PART WHY YOUNG PEOPLE AND THEIR TEACHERS, GUIDANCE COUNSELLORS AND THE EDUCATION SECTOR AS A WHOLE ARE LARGELY UNAWARE OF EMPLOYMENT PERSPECTIVES IN THIS FIELD.

3. INADEQUATE SUCCESSION PLANNING

THE HUMAN RESOURCES ASPECT OF THE ISSUE IS ONE OF THE MOST SERIOUS PROBLEMS THE LANGUAGE INDUSTRIES FACE. THE CANADIAN TRANSLATION INDUSTRY SECTORAL COMMITTEE ESTIMATES THAT 1,000 NEW TRANSLATORS WOULD HAVE TO BE HIRED EACH YEAR IN ORDER TO REPLACE THOSE WHO ARE LEAVING AND TO MEET THE GROWING DEMAND.

4. INADEQUATE INVESTMENT IN RESEARCH AND DEVELOPMENT

THERE IS NO R&D DATA ON THE LANGUAGE INDUSTRIES. GIVEN THEIR CHARACTERISTIC FRAGMENTATION, THE LANGUAGE INDUSTRIES HAVE NEITHER THE CRITICAL MASS NOR THE STRATEGIC PLANNING AND LEADERSHIP REQUIRED TO BENEFIT FROM R&D INVESTMENT. THE PRIVATE SECTOR DOES NOT HAVE THE AVAILABLE FUNDS, AND THE GOVERNMENT HAS NOT FOCUSED ON THE INDUSTRY'S NEEDS.²

ACCORDINGLY, THE ACTION PLAN STATES THAT STRENGTHENING THE TIES BETWEEN LANGUAGE INDUSTRIES AND INCREASING THEIR VISIBILITY ARE TOP PRIORITIES IN THE GOVERNMENT STRATEGY TO FACE THE FIRST TWO CHALLENGES LISTED ABOVE.

0.1.2. Content Management

0.1.2.1. *DEVELOPMENT STRATEGY*³

THIS SECTION PRESENTS A DEVELOPMENT STRATEGY PROPOSAL RELATED TO THE TECHNOLOGY AND THE PRODUCTS THAT MAY ENSURE CANADA A LEAD POSITION IN THE GLOBAL MARKET; THE STRATEGY IDENTIFIES OBJECTIVES AND MOST UP AND COMING ELEMENTS INCLUDING TECHNOLOGIES AND PRODUCTS; COMPANIES, INSTITUTIONS, RESEARCH ORGANIZATIONS, CHANCES OF SUCCESS, IMPEDIMENTS TO SUCCESS, TIMEFRAME FOR SUCCESS, BUSINESS DEVELOPMENT, MARKETING AND SALES STRATEGIES THAT WILL BE REQUIRED BASED ON CURRENT MARKET LEADERS AND THEIR GLOBAL SUCCESSES, FINANCIAL AND CAPITAL REQUIREMENTS AND HURDLES PLAYERS MUST OVERCOME AND CONCRETE RECOMMENDATIONS TO CANADA'S FINANCIAL SECTOR TO ENSURE THAT CANADA CAN ACHIEVE A LEAD AND MAINTAIN IT.

TO MAKE SURE CANADA MAINTAINS AND STRENGTHENS ITS POSITION IN THE CM FIELD, CANADA

² *THE NEXT ACT: NEW MOMENTUM FOR CANADA'S LINGUISTIC DUALITY. THE ACTION PLAN FOR OFFICIAL LANGUAGES* (2003).

³ THIS SECTION IS DRAWN FROM: *CONTENT MANAGEMENT INDUSTRY: REPORT PREPARED BY THE CONTENT MANAGEMENT COMMITTEE*, VERSION 1.3 (MARCH 31, 2004), CHAPTER 3.

SHOULD PAY ATTENTION TO FIVE ELEMENTS, AS DESCRIBED IN THE FOLLOWING SUB-SECTIONS, IN THE FORM OF LISTS OF TO-DO ITEMS.

0.1.2.1.1. People

1. CREATE STRONG PROGRAMS OF SYNERGY BETWEEN THE LARGE COMPANIES, THE SMEs AND THE R&D LABS AND ACADEMIA. THE GOVERNMENT MUST CONSIDER TAX INCENTIVES FOR LARGE COMPANIES TO WORK WITH SMEs AND WITH R&D LABS, ESPECIALLY IN ACADEMIA.
2. BACK THE CREATION OF GRADUATE PROGRAMS IN THE FIELD OF CM.
3. CREATE ACADEMIC CENTERS OF EXPERTISE AND OPEN THEM UP FOR TRAINING EMPLOYEES AT SMEs AND LARGE COMPANIES.
4. OFFER GRANTS TO STUDENTS WHO DECIDE TO PURSUE GRADUATE STUDIES IN THE FIELD OF CM.
5. OFFER GRANTS TO PROFESSORS WHO DO RESEARCH IN THE FIELD OF CM, BECAUSE OF THEIR IMPACT IN THE FUTURE CAREER CHOICES OF STUDENTS.
6. OFFER TAX INCENTIVES TO SMEs AND LARGE FIRMS WHO WORK IN CM TO TRAIN NEW GRADUATES.

0.1.2.1.2. Money

1. PROVIDE BETTER ACCESS TO CAPITAL FOR SMEs.
2. PROVIDE INCENTIVES TO VCS AND BANKS TO FUND SMEs IN CM AREAS.
3. AILIA SHOULD CONSIDER SETTING UP AN AILIA VENTURE FUND FOR THE LANGUAGE INDUSTRY AND SMEs ESPECIALLY THOSE LAUNCHING FROM GOVERNMENT R&D AND ACADEMIC LABS.
4. CREATE A SPECIFIC PROGRAM THAT WILL ENSURE THE FUNDING OF STRONG RESEARCH INITIATIVES IN THE FIELD OF CM.
5. MAKE SURE THAT RESEARCH CENTERS PARTICIPATING IN INTERNATIONAL RESEARCH PROJECTS HAVE ACCESS TO DOMESTIC FUNDING.

0.1.2.1.3. Language tools

1. GIVE FINANCIAL BACKING TO NOT-FOR-PROFIT ORGANIZATIONS TO FOSTER THE DEVELOPMENT AND SHARING OF PRE-COMMERCIAL LANGUAGE RESOURCES OR SOFTWARE TOOLS USEFUL TO CM RESEARCH CENTERS AND FIRMS
2. HAVE THE NRC TAKE A LEAD ROLE IN SETTING UP A NATIONAL PORTAL THAT LEVERAGES AND SHOWCASES CM TOOLS.

0.1.2.1.4. Demand

1. ADOPT STANDARDS, SUCH AS XML, THAT WILL GUARANTEE CANADIAN CITIZENS A HIGH LEVEL OF CUSTOMER SERVICE AND WILL BE CONDUCIVE TO THE INTERCHANGE OF INFORMATION IN THE USE OF CM TECHNOLOGIES.
2. MAKE SURE GOVERNMENT AGENCIES ALLOCATE A SHARE OF THEIR IT BUDGET TO THE PURCHASE OF CM PRODUCTS AND SERVICES.
3. CREATE A DIRECTORY OF FIRMS AND RESEARCH CENTERS IN THE FIELD OF CM. THAT DIRECTORY WOULD BE KEPT UP-TO-DATE BY THE COMPANIES AND RESEARCH ORGANIZATIONS THEMSELVES.

4. FUND TECHNOLOGICAL WINDOWS TO DEMONSTRATE THE REAL LIFE CAPABILITIES OF CM TOOLS IN GOVERNMENT ORGANIZATIONS.

0.1.2.1.5. Strategy

1. FOLLOWING IDC'S ADVICE, ENCOURAGE FIRMS TO PROVIDE CM SYSTEMS THAT "SOLVE THE COMPLEXITY CRISIS BY SIMPLIFYING BUSINESS PROCESSES AND UNIFYING ACCESS TO CONTENT", "OFFER RECORDS MANAGEMENT AND ARCHIVING CAPABILITIES" AND "UNIFY ENTERPRISE ACCESS TO BOTH UNSTRUCTURED AND STRUCTURED CONTENT AND OFFER TOOLS THAT HANDLE BOTH TOGETHER."⁴
2. CONVENE A COLLABORATIVE FORUM WITH LARGE COMPANIES, SMES, ACADEMIA AND GOVERNMENT RESEARCH LABS TO HELP SET THE AGENDA FOR THE CM INDUSTRY IN CANADA.
3. SET ANNUAL TARGETS AND MEASURE AGAINST THEM FOR THE CM INDUSTRY IN CANADA.
4. HOLD CONFERENCES ON SPECIAL THEMES IN CM TO FOSTER INFORMATION EXCHANGES.

0.1.3. Language Training⁵

0.1.3.1. *OPENING THE LINES OF COMMUNICATION – INTEGRATING DISPARATE ELEMENTS*

GREATER COMMUNICATION BETWEEN INDUSTRY SEGMENTS AND SECTORS WILL RESULT IN A LARGE NUMBER OF PARTNERSHIP AND INTEGRATION OPPORTUNITIES, WHICH WILL SPUR THE DEVELOPMENT OF LANGUAGE TECHNOLOGIES. FOLLOWING ARE SOME POTENTIAL PATHS FOR COLLABORATION RESULTING FROM BETTER COMMUNICATION.

PRIOR LEARNING ASSESSMENT RECOGNITION ORGANIZATIONS EXIST THAT CAN HELP LANGUAGE-TRAINING ORGANIZATIONS UNDERSTAND WHERE THERE ARE GAPS AND HOW LANGUAGE-SPECIFIC NEEDS CAN BE SERVED. FOR INSTANCE, THE [CANADA'S ONLINE PORTFOLIO](#) MODEL,⁶ AS PART OF THE GOING TO CANADA WEB SITE, IS AN INITIATIVE BY CAPLA AND FOUR FEDERAL DEPARTMENTS TO CREATE A PORTAL FOR IMMIGRANTS TO HELP EASE THE TRANSITION TO CANADA BY DEFINING A SET OF PORTFOLIOS TO PREPARE. LANGUAGE IS IDENTIFIED AS ONE OF THESE PORTFOLIOS, AND THE ONLINE NATURE OF THE PROJECT SUGGESTS A WEALTH OF OPPORTUNITIES FOR LANGUAGE TRAINING TECHNOLOGY PROVIDERS. THE POTENTIAL FOR INTEGRATION OF THIS INITIATIVE WITH EXISTING PRIOR LEARNING ASSESSMENT COMPONENTS THAT RELATE TO LANGUAGE, OR DEVELOPING THOSE COMPONENTS FOR DIFFERENT STREAMS OF LEARNERS (I.E. ACADEMIC, EMPLOYMENT, ETC.) IS VIRTUALLY UNLIMITED. THAT SAID, THERE IS LITTLE OFFICIAL REPRESENTATION IN THIS EXCELLENT INITIATIVE FROM THE LANGUAGE-TRAINING SECTOR, A FACT THAT WOULD CERTAINLY BE RECTIFIED WITH THE EXISTENCE OF A PROPER FORUM FOR THIS TYPE OF COMMUNICATION.

WORKPLACE BRIDGING AND SETTLEMENT LANGUAGE PROGRAMS CAN BENEFIT FROM ECONOMIES OF SCALE THAT TECHNOLOGY CAN PROVIDE SO THAT EACH PROGRAM ACROSS CANADA CAN BENEFIT FROM PEDAGOGICAL PROGRESS MADE IN OTHER PROGRAMS. IN MANY CASES, CONTENT

⁴ SUSAN FUNKE ET AL., *WORLDWIDE CONTENT MANAGEMENT SOFTWARE FORECAST, 2002-2007* (IDC, 2003), 10.

⁵ THIS SECTION IS DRAWN FROM: NISBET & ASSOCIATES LTD., *BRANDING CANADA'S ADVANTAGE: MARKET GAP ANALYSIS. REPORT FOR AILIA LANGUAGE TECHNOLOGY ROADMAP LANGUAGE TRAINING SUBSECTOR* (MARCH 2005), SECTION "CONCLUSIONS/ RECOMMENDATIONS."

⁶ [HTTP://WWW.CAPLA.CA/GOING_TO_CANADA.PHP](http://www.capla.ca/going_to_canada.php).

THAT HAS ALREADY BEEN DEVELOPED FOR SPECIFIC PURPOSES (I.E. SPECIFIC INDUSTRIES) HAS CROSSOVER POTENTIAL TO ADULTS ALREADY IN THE SYSTEM, TO ADULTS NOT YET IN THE SYSTEM (POTENTIAL IMMIGRANTS), AND TO YOUNG PEOPLE WITH LANGUAGE NEEDS COMING UP THROUGH THE SYSTEM. A LINE OF COMMUNICATION NEEDS TO BE ESTABLISHED TO FACILITATE THE DISSEMINATION OF THIS CONTENT TO PROVIDERS WHOSE LEARNERS WOULD BENEFIT FROM IT.

TECHNOLOGY TOOLS CAN BE DEVELOPED THAT INTEGRATE LANGUAGE TRAINING WITH OTHER SETTLEMENT SKILLS SUCH AS CULTURAL COMMUNICATION, PROFESSIONAL CERTIFICATION INFORMATION, NETWORKING AND INTERNSHIPS, AND EVEN SPECIFICALLY CANADIAN RESOURCES FOR DEVELOPMENT OF RESUMES, JOB SEARCH SKILLS, AND THE UNDERSTANDING OF OCCUPATION-SPECIFIC TERMINOLOGY, ALL HAVING BEEN IDENTIFIED AS MAJOR AREAS THAT JOB-ORIENTED LANGUAGE LEARNERS NEED TO IMPROVE.⁷ LANGUAGE NEEDS SHOULD BE STREAMLINED WITH THE [NATIONAL OCCUPATION CLASSIFICATION](#)⁸ AND [ESSENTIAL SKILLS PROFILES](#)⁹ DEVELOPED BY HUMAN RESOURCES AND SKILLS DEVELOPMENT, AND INTEGRATED WITH PROGRAMS SUCH AS THE [CANADIAN LEARNING BANK](#),¹⁰ TO ADD LANGUAGE COMPONENTS TO ALLOW CREDIT FOR WORKPLACE PROGRAMS. TO OVERCOME THE CHALLENGE WE HAVE ALREADY SEEN OF FINDING A WAY TO PAY FOR SOLUTIONS FOR WHICH THERE ARE CLEAR DEMANDS, IN INDUSTRY SEGMENTS POPULATED BY THE DISENFRANCHISED AND POORLY SERVED BY TECHNOLOGY, IT IS ESSENTIAL THAT THE NEEDS OF THESE SEGMENTS ARE PROPERLY COMMUNICATED, SO THAT THEY CAN THEN BE INTEGRATED BOTH WITH THE NEEDS OF SPECIFIC INDUSTRIES AND WITH WIDER GOVERNMENT INITIATIVES TO HELP IMMIGRANTS SETTLE AND FIND GAINFUL EMPLOYMENT.

PUBLIC SCHOOL SYSTEM ESL & FSL PROGRAMS EXIST INDEPENDENTLY OF THESE OTHER SYSTEMS AND ARE NOT GENERALLY ENABLED WITH TECHNOLOGY, EVEN THOUGH, IN MANY CASES, THEY ARE EQUIPPED TO DO SO. THERE ARE EXISTING ORGANIZATIONS (CASLT, CPF) TO PARTNER WITH TO ENABLE COMMUNICATION TO REACH THIS SECTOR AND BECOME INTEGRATED INTO A NATIONAL STRATEGY, ESPECIALLY IF THESE ORGANIZATIONS CAN SEE A BENEFIT TO AGREEING TO DISTRIBUTE THIS TYPE OF INFORMATION, NAMELY INCREASED SUPPORT FOR TEACHERS AND A BETTER UNDERSTANDING OF AVAILABLE RESOURCES FOR SCHOOLS. CASLT PRODUCES SOME EXCELLENT RESOURCES FOR SECOND LANGUAGE TEACHERS IN THE PUBLIC SCHOOL SYSTEM, HOWEVER THESE RESOURCES TEND TO FOCUS ON TRADITIONAL (I.E. NOT TECHNOLOGY-ENABLED) METHODS. RESOURCE DEMAND ALWAYS EXCEEDS THE SUPPLY OF MONEY TO PROVIDE THESE RESOURCES, THUS PRESENTING THE OPPORTUNITY FOR TECHNOLOGY SOLUTIONS OR PARTNERSHIPS TO FILL THIS GAP. IN CPF'S LATEST [STATE OF FRENCH-SECOND-LANGUAGE EDUCATION IN CANADA](#) REPORT,¹¹ THE USE OF TECHNOLOGY DID NOT EVEN RATE AS A SUBJECT OF DISCUSSION, EVEN AS THE ISSUE OF HOW TO MOTIVATE TECHNOLOGICALLY LITERATE YOUTH TO STUDY LANGUAGE WAS DISCUSSED IN DETAIL.

PRIVATE LANGUAGE SCHOOLS ARE GENERALLY VERY KEEN ON THE OPPORTUNITY TO PROVIDE THEIR STUDENTS WITH ACCESS A DEEPER EXPERIENCE OF CANADIAN LIFE AND THEREFORE OF THE LANGUAGE THEY ARE STUDYING. GENERALLY SPEAKING, THE OPPORTUNITY TO INTEGRATE

⁷ [HTTP://WWW.LANGUAGE.CA/PROJECTS%2004-05/ELT/ELT%20RESEARCH%20FINAL%20REPORT.PDF](http://www.language.ca/projects%2004-05/ELT/ELT%20RESEARCH%20FINAL%20REPORT.PDF).

⁸ [HTTP://WWW23.HRDC-DRHC.GC.CA/2001/E/GENERIC/WELCOME.SHTML](http://www23.hrdc-drhc.gc.ca/2001/e/generic/welcome.shtml).

⁹ [HTTP://WWW15.HRDC-DRHC.GC.CA/ENGLISH/GENERAL/READERS_GUIDE_WHOLE.ASP](http://www15.hrdc-drhc.gc.ca/english/general/readers_guide_whole.asp).

¹⁰ [HTTP://WWW.BCIT.CA/CLB/](http://www.bcit.ca/clb/).

¹¹ [HTTP://WWW.CPF.CA/ENGLISH/RESOURCES/FSL2004/2004%20INDEX.HTM](http://www.cpf.ca/english/resources/fsl2004/2004%20INDEX.HTM).

PROGRAMS SUCH AS INTERNSHIP AND VOLUNTEER PROGRAMS THAT EMPHASIZE COMMUNITY INVOLVEMENT WITH A WIDELY RECOGNIZED INITIATIVE INVOLVING THE LABOUR MARKET OR AN ACADEMIC ENVIRONMENT WOULD BE WELCOMED WITH OPEN ARMS. FOR INSTANCE, A PILOT PROJECT THAT SAW STUDENTS FROM PRIVATE INSTITUTIONS ACT AS EMPLOYEES FOR AN INDUSTRY WHOSE TRAINING NEEDS MATCHED THE NEEDS OF THESE TEST SUBJECTS WOULD OPEN THE DOORS TO BOTH SIDES, PROVIDING THE LANGUAGE TRAINING PROVIDER WITH BOTH A PLACEMENT SERVICE AND A TEST ENVIRONMENT TO INNOVATE NEW PROGRAMS, AND PROVIDING THE INDUSTRY WITH A CODIFICATION OF ITS LANGUAGE TRAINING NEEDS AND A POTENTIAL PARTNER TO HELP FULFILL THESE NEEDS. A LICENSABLE TECHNOLOGY PRODUCT OR SERVICE, RESOURCED BY THE TARGET INDUSTRY, THAT FACILITATES THIS INTEGRATION BY LINKING AN EXISTING LANGUAGE STANDARD WITH STANDARDS OF THE HOST INDUSTRY WOULD ALLOW THIS TYPE OF INTERACTION ON A LARGER AND MORE STANDARDIZED SCALE. OF COURSE, IN ORDER FOR SUCH RELATIONSHIPS TO BE DEVELOPED, THE PRIVATE SECTOR NEEDS TO KNOW WHERE THE OPPORTUNITIES LIE, EXPERTISE THAT IS READILY ACCESSIBLE TO A PUBLIC SECTOR WORKPLACE LANGUAGE PROVIDER.

ALSO, AS LANGUAGE SCHOOLS PURSUE THE LIFELONG LEARNING COMMERCIAL TREND, BARRIERS TO PARTNERSHIP WITH COLLEGES AND UNIVERSITIES HAVE FORCED THEM TO GO DOWN THE AGE LADDER RATHER THAN UP, PUTTING THEM INTO CONTACT WITH THE SAME DEMOGRAPHIC AS THE PUBLIC SCHOOL SYSTEM. THERE IS OF COURSE COMPETITION HERE, HOWEVER THERE ARE ALSO OPPORTUNITIES TO BE EXPLORED, PARTICULARLY WITH PROVINCIAL FUNDING FOR SECOND LANGUAGE PROGRAMS ALWAYS A CONCERN AND PARENTS ANXIOUS TO SEE THEIR CHILDREN'S SUCCESSFUL TRANSITION TO HIGHER EDUCATION.

COLLEGE AND UNIVERSITY LANGUAGE PROGRAMS ARE VALUABLE TO THE PARENT INSTITUTIONS BOTH AS INDEPENDENT REVENUE-GENERATORS THAT LEVERAGE THE INSTITUTIONAL BRAND AND AS FEEDER SCHOOLS FOR FURTHER LEARNING AT THE INSTITUTION. THIS IS ESPECIALLY IMPORTANT WITH THE RECENT TENDENCY TO WANT TO RECRUIT LIFELONG LEARNERS, WHO WILL RETURN FOR TRAINING TO A BRAND AND A SYSTEM WITH WHICH THEY HAVE HAD PREVIOUS SUCCESS. THIS HAS BEEN DONE TO INGENIOUS EFFECT IN THE [TOWES](#) ASSESSMENT,¹² DEVELOPED AT BOW VALLEY COLLEGE IN PARTNERSHIP WITH THE BC CONSTRUCTION INDUSTRY SKILLS IMPROVEMENT COUNCIL, AN EXCELLENT EXAMPLE NOT SPECIFICALLY FOCUSED ON LANGUAGE. WITH ITS ACCOMPANYING 'MEASURE UP' TOOL, AN ONLINE SKILLS ASSESSMENT TOOL, THE COLLEGE IS POSITIONING ITSELF AS A LEADER IN CAPTURING AND THEN TRAINING INDUSTRIES FULL OF LIFELONG LEARNERS. THIS CLEARLY POINTS TO THE NEED, AND AN INCENTIVE, FOR CLOSE COMMUNICATION BY LANGUAGE TRAINERS IN ACADEMIA WITH WORKPLACE LANGUAGE TRAINING PROVIDERS. WITH LANGUAGE AND TECHNOLOGY AS ADDED COMPONENTS TO THIS TYPE OF SKILLS ASSESSMENT, WE SEE THE POTENTIAL FOR A GLOBAL CHAIN THAT EXPANDS THE OFT-STATED GOAL OF BRINGING THE WORLD'S BEST AND BRIGHTEST TO WORK IN CANADA BEYOND ITS CURRENT FOCUS ON STRICTLY ACADEMIC QUALIFICATIONS.

CANADA'S LANGUAGE RESEARCH COMMUNITY ALSO NEEDS TO BE INTEGRATED INTO THIS PICTURE, ESPECIALLY HAVING BEEN RECENTLY EMPOWERED WITH DEVELOPMENT OF A TECHNOLOGY RESEARCH CENTRE. NON-PROPRIETARY GAINS BEING MADE IN RESEARCH SHOULD BE COMMUNICATED SO THAT THE INDUSTRY AT LARGE CAN KEEPING UP-TO-DATE WITH DEVELOPMENTS IN LANGUAGE TRAINING TECHNOLOGY AND JUMP ON OPPORTUNITIES WHEN THEY ARE PRESENTED.

¹² [HTTP://WWW.TOWES.COM/](http://www.towes.com/).

FINALLY, IT IS SURELY TOO OBVIOUS A POINT TO MISS THAT TWO OF THE OTHER SUB-SECTORS OF CANADA'S LANGUAGE INDUSTRY, CONTENT MANAGEMENT AND SPEECH PROCESSING, ARE BY DEFINITION TECHNOLOGY-BASED. IN AREAS WHERE THE LANGUAGE-TRAINING SUB-SECTOR STILL CANNOT FIND RESOURCES AND EXPERTISE, IT COULD CERTAINLY FIND SOME POWERFUL IDEAS IN COLLABORATION WITH THESE OTHER SECTORS. WITH ITS PROVEN RELUCTANCE TO ADOPT TECHNOLOGY AND ITS CORRESPONDING LACK OF EXPERTISE, THE MODEL OF LANGUAGE-TRAINING AS A RECEIVER AND OTHER SECTORS AS A GIVER OF TECHNOLOGY IS PERHAPS ONE THAT SHOULD BE CONSIDERED. IN RETURN, LANGUAGE TRAINING, ALREADY A MATURE MARKET TO BE SURE, OFFERS NEVERTHELESS A GLOBAL DISTRIBUTION CHAIN THAT THE TWO SUB-SECTORS ALREADY MENTIONED SHOULD CERTAINLY BE INTERESTED IN SHARING. EVEN THE TRANSLATION SUB-SECTOR OFFERS EXCELLENT PARTNERSHIP OPPORTUNITIES THAT WE CAN ALREADY SEE DEMONSTRATED IN SEVERAL MODELS PRESENTED ABOVE. WITH A BETTER FLOW OF INFORMATION, THERE IS NO REASON TO SUPPOSE THAT SOME OF THE TOP LANGUAGE TECHNOLOGY PRODUCTS IN THE MARKET IN THE COMING YEARS SHOULDN'T BE CANADIAN.

IN VIEW OF ENABLING SUCH A CROSS-POLLINATION OF IDEAS, IT IS WORTH REITERATING HERE THE IDEA ALREADY PUT FORWARD IN OTHER LANGUAGE INDUSTRY STUDIES OF A COMMUNICATIONS PORTAL, WITH THE ADDED PROVISIO THAT SUCH A MECHANISM FACILITATES COMMUNICATION BETWEEN ALL STAKEHOLDERS, FROM ALL SEGMENTS MENTIONED HERE. THE NETWORK CREATED BY THIS PORTAL COULD BE USED NOT ONLY FOR COMMUNICATION BUT ALSO FOR PILOT PROJECTS AND FOCUS GROUPS FOR NEW PRODUCTS. THE CONCEPT OF THE VIRTUAL SHOWCASE, WITH TECHNOLOGY SAMPLES AVAILABLE FOR USE BY POTENTIAL PARTNERS OR CUSTOMERS, COULD ALSO BE INTRODUCED, PROVIDED THAT INTELLECTUAL PROPERTY RIGHTS WERE CAREFULLY PROTECTED.

AN EXCELLENT EXISTING MODEL FOR THIS TYPE OF FACILITATION PORTAL IS CANADA'S SCHOOLNET,¹³ A PARTNERSHIP WITH THE PROVINCIAL AND TERRITORIAL GOVERNMENTS, THE EDUCATION COMMUNITY AND THE PRIVATE SECTOR, WHICH PROMOTES THE EFFECTIVE USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGIES (ICT) IN LEARNING. IN ADDITION TO LEARNING RESOURCES FOR SCHOOLS, TEACHERS AND STUDENTS, TEACHER RECRUITMENT DATABASES, AND JOB BANKS, SCHOOLNET'S '@SCHOOLNET TODAY' IS AN ONLINE NEWS SOURCE THAT TRACKS INNOVATIVE E-LEARNING PROJECTS, RESOURCES, AND EVENTS. SCHOOLNET WAS FUNDED BY A COMBINATION OF PUBLIC AND PRIVATE RESOURCES, AND IS AN IDEAL MODEL FOR A COMMUNICATIONS FORUM THAT CAN BUILD ALLIANCES AND POOL RESOURCES WITHIN A GOAL-FOCUSED COMMUNITY. A SIMILAR STRUCTURE AND FUNDING MODEL, WITH CONTENT STRUCTURED AROUND THE DEVELOPMENT AND INTEGRATION OF THE LANGUAGE INDUSTRY, WOULD CREATE A NATIONAL POWERHOUSE OF IDEAS AND RESOURCES THAT WOULD CERTAINLY TRANSLATE INTO INNOVATION AND DEVELOPMENT.

0.1.3.2. *DIGGING FOR GOLD – FINDING THE RESOURCES TO DRIVE DEVELOPMENT*

THE GREATEST SOURCE OF LONG-TERM RESOURCES IS UNQUESTIONABLY THE PRIVATE SECTOR. WHILE GOVERNMENT FUNDING FOR ANY PARTICULAR AREA CAN BE SUBJECT TO SHIFTING POLITICAL PRIORITIES, RESOURCES FROM THE PRIVATE SECTOR DEPEND ALMOST EXCLUSIVELY ON BOTTOM-LINE RESULTS, AND SO, IN THAT SENSE, WILL ALWAYS BE AVAILABLE FOR IDEAS THAT CAN DEMONSTRATE FUTURE PROFITABILITY. BETWEEN 15% AND 25% OF THE SUCCESSFUL

¹³ [HTTP://WWW.SCHOOLNET.CA](http://www.schoolnet.ca).

PRIVATE SECTOR LANGUAGE TECHNOLOGY PRODUCTS PRESENTED ABOVE INVOLVED SOME TYPE OF CONTENT PROVIDER/RESOURCE PROVIDER PARTNERSHIP. THIS NEED NOT BE RESTRICTED, OR EVEN FOCUSED, ON SUCH AREAS OF LOW PALATABILITY TO MANY EDUCATORS AS VENTURE CAPITAL AND ASSET ACQUISITION. IN FACT, THE MODELS CHOSEN REFLECT THE HIGH POTENTIAL FOR SUCCESS IN JOINT VENTURES AND WORKING ALLIANCES.

FOR EXAMPLE, IT IS WORTH LOOKING CLOSELY AT THE MODEL OF IDENTIFYING A MIX OF LANGUAGE AND HUMAN RESOURCE NEEDS IN A SPECIFIC INDUSTRY AND WORKING TOWARD A MARKET-READY PRODUCT THAT WILL SERVE THAT NICHE. ONE OF THE MOST INTERESTING HOMEGROWN EXAMPLES ALREADY CITED IS THE BANK OF CANADA'S SECOND LANGUAGE CAFÉ. THOUGH THIS IS NOT A PRIVATE SECTOR COMPANY, MANY LARGER COMPANIES IN THE PRIVATE SECTOR SHARE BOTH ITS HUMAN RESOURCE NEEDS AND ITS COMMITMENT TO SKILLS TRAINING. THE [INTERNATIONAL PHARMACY GRADUATE PROGRAM](#),¹⁴ IN WHICH BOTH THE PROVINCIAL GOVERNMENT AND THE INDUSTRY HAVE A STAKE IN FUNDING AND REAPING THE BENEFITS OF A SUCCESSFUL PROGRAM, SHOWS THAT LANGUAGE TRAINING CAN BE INTEGRATED INTO A HIGHER LEARNING PROGRAM TAILORED SPECIFICALLY TO THE HUMAN RESOURCE NEEDS OF A SOPHISTICATED SERVICE INDUSTRY. THE BEAUTY OF APPLYING TECHNOLOGY TO THIS TYPE OF PROGRAM IS ITS SCALABILITY, IN THAT, THROUGH LICENSING OR OTHER DISTRIBUTION AGREEMENTS, THE TECHNOLOGY CAN BE DELIVERED TO MULTIPLE LOCATIONS, EVEN GLOBALLY, FROM ONE LOCATION TO MANY LOCATIONS, THEREBY POSITIONING THEMSELVES TO SERVE COMPANIES OR INDUSTRIES ON A TRULY GRAND SCALE.

WE HAVE IN THE DECISION TO BUILD LTRC THE BEGINNING OF A DEVELOPMENT OF AN INDUSTRY CLUSTER, A REGIONAL OR THEMATIC BLOCK OF COMPANIES SEEKING INVESTMENT OR PARTNERSHIP WHICH CAN THEN BE SUMMONED FOR SPECIFIC TRADE MISSIONS TO MEET PRE-QUALIFIED LEADS, A KIND OF TEAM CANADA FOR THE LANGUAGE INDUSTRY. THERE ARE SEVERAL EXCELLENT EXISTING MODELS OF THIS TYPE OF CLUSTER, ONE OF THE MOST RELEVANT TO THIS STUDY BEING A PARTNERSHIP BETWEEN OTTAWA GLOBAL MARKETING, CANADA'S TECHNOLOGY TRIANGLE AND THE GREATER TORONTO MARKETING ALLIANCE, ALL CLUSTERS IN THEIR OWN RIGHT, BUT UNITED WITH THE UNOFFICIAL LABEL OF [ONTARIO'S TECH CORRIDOR](#)¹⁵. THE BENEFIT OF A LANGUAGE TECHNOLOGY CLUSTER, OF COURSE, IS NOT ONLY FOR BRANDING AND NETWORKING BUT ALSO TO LEVERAGE THE INHERENTLY COMPETITIVE LOCAL GOVERNMENT IN A CLUSTER'S DEVELOPMENT EFFORTS. THIS TYPE OF TEAM COULD THEN PARTNER WITH OTHER TECHNOLOGY-BASED INDUSTRY CLUSTERS AND TAKE ADVANTAGE OF KNOWLEDGE AND NETWORKING OPPORTUNITIES TO EXPOSE THEMSELVES TO GREATER OPPORTUNITIES. A NEWSLETTER COULD THEN BE SENT TO THESE AND OTHER SIMILAR ORGANIZATIONS THAT WOULD KEEP THE IT SEGMENT, AND BY EXTENSION ITS RESOURCE PROVIDERS, UP TO SPEED ON DEVELOPMENTS AND OPPORTUNITIES IN LANGUAGE TECHNOLOGY.

IN GATHERING THE RESOURCES TO ACHIEVE AN AGENDA SPECIFIC TO UNITING LANGUAGE TRAINING, INTEGRATION OF DIFFERENT HIGH-PRIORITY GOVERNMENT INITIATIVES IS CRUCIAL. WE HAVE ALREADY SEEN THAT CANADA IS BEHIND IN TERMS OF POLITICAL CHAMPIONSHIP OF ITS LANGUAGE INDUSTRY. WITH THIS IN MIND, ANY NUMBER OF CURRENT MAJOR PRIORITIES IS APPLICABLE TO LANGUAGE TRAINING. IN THE [KNOWLEDGE MATTERS](#)¹⁶ SEGMENT OF CANADA'S

¹⁴ [HTTP://WWW.NEWONTARIOPHARMACIST.COM/IPG](http://www.newontariopharmacist.com/ipg).

¹⁵ [HTTP://WWW.OTTAWAREGION.COM/NEWSLETTERS/UPDATE_1203.HTML#MAINTEXT1](http://www.ottawaregion.com/newsletters/update_1203.html#maintext1).

¹⁶ [HTTP://WWW11.SDC.GC.CA/SL-CA/HOME.SHTML](http://www11.sdc.gc.ca/sl-ca/home.shtml).

INNOVATION STRATEGY, THERE IS A CALL TO BETTER SUPPORT THE INTEGRATION OF IMMIGRANTS INTO CANADA'S LABOUR MARKET THROUGH THE SUPPORT OF LANGUAGE TRAINING. KEY PHRASES SUCH AS THE "KNOWLEDGE-BASED ECONOMY", "LIFELONG LEARNING", AND THE "BEST & BRIGHTEST" ARE IN CONSTANT POLITICAL PLAY ACROSS A WHOLE SPECTRUM OF PROGRAMS, AND MUST BE USED IN COMMUNICATIONS TO UNDERLINE THE RESIDENCE OF THE LANGUAGE INDUSTRY AT THE VERY CORE OF CANADA'S FUTURE ASPIRATIONS.

THIS FOCUS ON IMPORTANT POLITICAL INITIATIVES COULD BE BROUGHT TO BEAR WITH AN APPLICATION FOR THE CREATION OF A [NETWORK OF CENTRES OF EXCELLENCE](#),¹⁷ WHOSE MISSION IT WAS TO RESEARCH THE DEVELOPMENT OF TECHNOLOGY IN THE LANGUAGE INDUSTRY, SPECIFICALLY RELATING TO STANDARDIZATION AND CERTIFICATION. THE [CANADIAN LANGUAGE AND LITERACY RESEARCH NETWORK](#)¹⁸ HAS ALREADY TAKEN STEPS TOWARD THIS IN THE AREA OF LITERACY, AND INDEED CONTAINS ITS OWN DATABASE OF FUNDING OPPORTUNITIES, HOWEVER ITS FOCUS IS PRIMARILY ON IMPROVING CHILD LITERACY. A SIMILAR NETWORK FOCUSING ON THE APPLICATION OF TECHNOLOGY TO LANGUAGE ACQUISITION WOULD HELP TO UNITE DISPARATE INDUSTRY ELEMENTS AND FOCUS ON SOME COMMON GOALS.

THE NOTION OF A COMMUNICATIONS PORTAL HAS ALREADY BROUGHT FORWARD, AND FUNDING IS CERTAINLY AN AREA WHERE INFORMATION SHOULD BE CENTRALIZED. TO ACCESS GOVERNMENT FUNDING OPPORTUNITIES, THE PORTAL SHOULD LIST ALL FUNDING OPPORTUNITIES THAT MIGHT RELATE TO THE LANGUAGE INDUSTRY. TO HELP LANGUAGE PROFESSIONALS ACCESS PRIVATE FUNDING, THE RESOURCE BANK COULD ALSO INCLUDE DOCUMENT TEMPLATES, CASE STUDIES, BUSINESS PLAN DEVELOPMENT TOOLS, AND INFORMATION ON STRUCTURING VARIOUS TYPES OF VENTURES AND PARTNERSHIPS. THIS COULD EVEN INCLUDE A "BLIND" FORUM OR FACILITATOR FOR MEMBERS OF THE LANGUAGE INDUSTRY TO SEEK OUT THESE PARTNERSHIPS OR EXPLORE TECHNOLOGY INTEGRATION WITHOUT FEAR OF REVEALING THEIR ORGANIZATIONS' PLANS. THERE WOULD ALSO NEED TO BE SOME OBJECTIVE AUDITING INFORMATION, PERHAPS AFTER CONSULTATION WITH FINANCIAL SERVICES ORGANIZATIONS, TO HELP PROVIDERS UNDERSTAND THE VALUE IN THEIR OWN SYSTEMS, OR HOW VALUE CAN BE ADDED WHEN IT IS LACKING.

IN ADDITION, PROCUREMENT POLICIES FOR LANGUAGE TRAINING IN THE CANADIAN PUBLIC SERVICE SHOULD BE MADE MORE TRANSPARENT, AND MORE OUTSOURCING SHOULD BE DONE, PARTICULARLY IN THE AREA OF LARGE-SCALE NEEDS AREAS IN WHICH TECHNOLOGY WOULD BRING ECONOMIES OF SCALE. A CONCEPT THAT IS OFTEN TRIED TO SPARK INNOVATION IS TO HOLD CONTESTS FOR DEVELOPMENT OF MARKETABLE TECHNOLOGY TOOLS, THE RESULTS OF WHICH BENEFIT NOT ONLY THE WINNER AND THE CLIENT THAT GETS THE TOOL BUT ALSO THE NUMEROUS OFFSHOOT PROJECTS, AND FUNDING OFFERS, THAT RESULT FROM A PROPERLY STRUCTURED COMPETITION.

0.1.3.3. *LEVERAGING CANADA'S REPUTATION*

WE HAVE SEEN THAT THE QUESTION OF WHETHER, IN ESTABLISHING A STANDARD FOR A LANGUAGE TECHNOLOGY PRODUCT OR SERVICE, IT IS BETTER TO GO CANADIAN OR GO GLOBAL CAN BE A DIFFICULT CHOICE. THE LOGICAL DECISION FROM A BUSINESS POINT OF VIEW MIGHT OF COURSE SEEM TO BE TO GO WITH THE BIGGER MARKET, AND THEREFORE TO FOCUS ON AN INTERNATIONALLY RECOGNIZED, OR AT LEAST MORE WIDELY RECOGNIZED STANDARD, THAN A

¹⁷ [HTTP://WWW.NCE.GC.CA](http://www.nce.gc.ca).

¹⁸ [HTTP://WWW.CLLRNET.CA/](http://www.cllrnet.ca/).

CANADIAN ONE. THE OTHER WAY TO LOOK AT THIS, HOWEVER, IS TO SUGGEST THAT A STANDARD THAT IS OF HIGHER QUALITY AND MARKETABILITY THAN EXISTING ONES MIGHT STAND A FAIRLY GOOD CHANCE OF BECOMING A GLOBAL STANDARD IF IT WERE ATTRACTIVE ENOUGH. A STATISTICS CANADA STUDY REVEALED THAT 67% OF NEWCOMERS TO CANADA PLAN TO FURTHER THEIR EDUCATION IN CANADA. FURTHERMORE, THE NEW GLOBAL CITIZEN IS A REALITY, IN WHICH NATIONAL BORDERS ARE NO LIMIT EITHER TO EDUCATION OR EMPLOYMENT. THE INTEGRATION OF THIS PERCEPTION WITH TECHNOLOGY SOLUTIONS THAT DRIVE PRIOR LEARNING ASSESSMENTS ON SETTLEMENT, WORKPLACE, AND ACADEMIC LANGUAGE TRAINING WOULD TAKE ADVANTAGE OF “THE CANADIAN DREAM” AND PLACE CANADIAN LANGUAGE TRAINING TECHNOLOGY AMONG THE LEADERS IN THE WORLD, GIVING CANADA ACCESS TO THE “BEST AND BRIGHTEST” IN THE GLOBAL COMMUNITY.

CANADA’S AIM OF MOVING AWAY FROM A RESOURCE-BASED ECONOMY AND TOWARD BECOMING ONE OF THE WORLD’S LEADING KNOWLEDGE-BASED ECONOMY IS ANOTHER INTERNAL POLITICAL THEME THAT COULD BE LEVERAGED TO BRAND OUR LANGUAGE INDUSTRY. WITH CANADA’S POLITICALLY NEUTRAL REPUTATION, OFFICIAL BILINGUALISM, AND MULTICULTURAL DEMOGRAPHIC THROWN INTO THE MIX, IT’S HARD TO UNDERSTAND HOW WE COULDN’T BE A LEADER IN THIS AREA. IN CHINA, FOR INSTANCE, WHERE, THANKS TO THE LIKES OF DR. NORMAN BETHUNE AND MARK ROWSWELL (A.K.A. DASHAN), THE REPUTATION OF CANADIANS SUPERCEDES THAT OF THE CITIZENS OF ANY OTHER WESTERN COUNTRY, THERE ARE 54,000 PRIVATE [ENGLISH LANGUAGE SCHOOLS](#)¹⁹ AND, OTHER THAN STANDARDIZED TESTING FOR COLLEGE ENTRANCE, THE CENTRAL GOVERNMENT HAS NO SET EDUCATIONAL POLICY OR CURRICULUM FOR EFL/ESL, AND THERE IS NO SINGLE MINISTRY OF EDUCATION DOCUMENT STATING THE GOVERNMENT POLICY ON EFL/ESL IN CHINA.

ALMOST IMMEDIATELY FOLLOWING THE AWARDING OF THE 2008 OLYMPICS TO BEIJING, THE CHINESE GOVERNMENT MANDATED THAT ALL SERVICE EMPLOYEES SHOULD LEARN ENGLISH BY THE START OF THE GAMES. THIS MOVE IS IMPORTANT TO CANADA NOT ONLY BECAUSE OF THE OBVIOUS WEALTH OF OPPORTUNITIES FOR LANGUAGE TRAINERS ARISING FROM THIS OBJECTIVE, BUT ALSO AS A LESSON IN THE INTERCONNECTEDNESS OF A MAJOR INTERNATIONAL EVENT SUCH AS THE OLYMPICS WITH LANGUAGE AND LANGUAGE TRAINING. WITH ITS HOSTING OF THE VANCOUVER/WHISTLER WINTER GAMES IN 2010, CANADA IS PRESENTED WITH THE BEST POSSIBLE OPPORTUNITY TO SHOWCASE ITS VIBRANT MULTICULTURALISM AND LINGUISTIC EXPERTISE. WITH THE INFLUX OF ATHLETES, MEDIA, AND SPECTATORS FROM ALL PARTS OF THE GLOBE SPEAKING A FULL ARRAY OF LANGUAGES, THERE WILL BE A CORRESPONDING NEED FOR CREATIVE LANGUAGE SOLUTIONS, NOT TO MENTION A GLOBAL STAGE ON WHICH TO SHOWCASE THOSE SOLUTIONS. THE KEY WILL CERTAINLY BE MOBILITY, AS EACH TYPE OF INTERACTION WITH THE GAMES, FROM VOLUNTEER AND OFFICIAL THROUGH COMPANIES, PARTNERS, AND SUPPORT STAFF (CATERING, HEALTH, TRANSPORTATION, ACCOMMODATION, ETC.) TO ATHLETES AND MEDIA, WILL ENCOUNTER A UNIQUE MIXTURE OF LANGUAGE ISSUES.

THE OLYMPICS IS NOT ONLY A SPORTING EVENT BUT, MORE IMPORTANTLY IN THIS CONTEXT, AN INFORMATION BONANZA. FROM REAL-TIME RESULTS REPORTING TO PRESS RELEASES TO INTERVIEWS, THIS IS A GLOBAL EXERCISE IN CROSS-CULTURAL COMMUNICATION, WITH LANGUAGE AS THE DRIVER. IN THE FINAL ASSESSMENT, ONE OF THE GREAT ACCOMPLISHMENTS OF THE ATHENS OLYMPICS, LOGISTICAL AND ATHLETIC CONSIDERATIONS ASIDE, WAS THE INTEGRATION

¹⁹ [HTTP://WWW.USINGENGLISH.COM/ESL-IN-CHINA/CHINA-OR-CHINGLAND.PDF](http://www.usingenglish.com/esl-in-china/china-or-chingland.pdf).

OF THE [FRENCH LANGUAGE](#) INTO ALL OLYMPIC COMMUNICATIONS, THE FIRST TIME THAT, OUTSIDE A FRENCH HOST COUNTRY, LANGUAGE SERVICES REQUIREMENTS FOR THE FRENCH-SPEAKING MEMBERS OF THE OLYMPIC FAMILY HAD BEEN FULLY SATISFIED²⁰. CANADA IS IN THE POSITION TO BUILD ADMIRABLY UPON THIS FOUNDATION. THE ONUS WILL BE ON CANADIAN LANGUAGE TECHNOLOGY PROVIDERS TO DEMONSTRATE THE USEFULNESS OF THEIR SOLUTIONS, IN AND BETWEEN ANY NUMBER OF LANGUAGES, TO SPECIFIC OLYMPIC APPLICATIONS AND, IN GREATER MEASURE, TO THE CONTINUALLY GLOBALIZING COMMUNITY AT LARGE.

0.1.3.4. *STANDARDIZATION THROUGH BRANDING – THE CONCEPT OF A LANGUAGE INDUSTRY MASTER BRAND*

IN ANY COMMUNITY, FROM ACADEMIC TO CORPORATE TO NOT-FOR-PROFIT, ONE OF THE MOST POWERFUL ENGINES OF OPERATION, PROMOTION, AND GROWTH IS THE EXISTENCE OF A STRONG BRAND. THOUGH WE MAY NOT ALWAYS BE COMFORTABLE WITH IT, THE FACT OF THE MATTER IS THAT MOST OF US LIVE IN A BRANDED WORLD. WHETHER THE RESULTS OF THAT ARE HARVARD CARRYING AN ENDOWMENT LARGER THAN THE GNP OF MANY COUNTRIES, COCA-COLA CONSUMED IN OVER 200 COUNTRIES, OR THE RED CROSS AS THE WORLD'S MOST RECOGNIZED HUMANITARIAN AID ORGANIZATION, THE ABILITY TO UNITE A SET OF PRINCIPLES AND A MESSAGE UNDER THE UMBRELLA OF A RECOGNIZABLE BRAND HAS BROUGHT SUCCESS TO AN UNCOUNTABLE NUMBER OF EDUCATIONAL, BUSINESS, AND ALTRUISTIC VENTURES.

IT IS OF COURSE A FUTILE EXERCISE TO UNDERTAKE A BRANDING PROCESS WITHOUT AT LEAST SOME LEVEL OF STANDARDIZATION. WE HAVE SEEN THAT, IN THE CONTEXT OF CANADIAN LANGUAGE TRAINING, THERE ARE FOUR SEPARATE STREAMS (ASSESSMENT, INSTITUTIONAL, MATERIALS, PROFESSIONAL DEVELOPMENT), AND NO COMMON THREAD THAT TIES THEM TOGETHER, AND THAT EVEN WITHIN EACH OF THESE AREAS, THE FOUR GENERAL MOTIVATORS OF LANGUAGE LEARNERS (ACADEMIC, WORKPLACE, SETTLEMENT, AND PERSONAL DEVELOPMENT) EACH HAS ITS OWN SET OF RULES. IT IS CERTAINLY IN THE LONG-TERM INTEREST OF THE INDUSTRY TO WORK TOWARDS SOME TYPE OF UNIFYING STANDARD TO PULL THIS ALL TOGETHER, HOWEVER, IF A SERIES OF DEMONSTRABLE STANDARDS IS ALREADY ASSUMED TO EXIST, OR IS CLOSE TO EXISTING, THEN IT BECOMES LESS IMPORTANT TO HAVE A UNIFIED STANDARD THAN IT DOES TO HAVE A UNIFIED BRAND. WITNESS THE VALUE TO TECHNOLOGY COMPANIES OF BEING A [MICROSOFT CERTIFIED PARTNER/PROVIDER](#),²¹ A PROGRAM IN WHICH A MASSIVE VARIETY OF DIFFERENT ORGANIZATIONS CAN PARTICIPATE WHILE ADHERING TO ANY NUMBER OF REGIONAL AND SPECIFIC INDUSTRY STANDARDS, BUT WHICH DEFINES ELEVEN CORE COMPETENCIES IN WHICH PARTICIPATING ORGANIZATIONS MAY RECEIVE CERTIFICATION. THE BENEFITS FOR MICROSOFT ARE THE FURTHER PROLIFERATION OF ITS BRAND AND THE REINFORCEMENT OF ITS POSITION OF LEADERSHIP; THE BENEFITS FOR PARTNERS ARE IMMEDIATE CREDIBILITY AND RECOGNITION OF EXPERTISE; THE BENEFIT FOR CONSUMERS IS AN ASSURANCE THAT THE ORGANIZATION HAS UNDERGONE A PROCESS AND CAN THEREFORE PROVIDE A LEVEL OF SERVICE THAT CONFORMS TO A RECOGNIZED STANDARD.

CANADA, IN THIS MODEL, IS MICROSOFT, OR SHOULD AT LEAST POSITION ITSELF THE WAY MICROSOFT HAS WITH REGARD TO SETTING ITSELF UP AS A LEADER. A SET OF CORE COMPETENCIES SHOULD BE DEVELOPED FOR LANGUAGE, FOR ALL TYPES OF PROVIDERS FROM ALL TYPES OF

²⁰ [HTTP://EN.BEIJING-2008.ORG/88/15/ARTICLE211631588.SHTML](http://en.beijing-2008.org/88/15/article211631588.shtml).

²¹ [HTTPS://PARTNER.MICROSOFT.COM/GLOBAL/40009768](https://partner.microsoft.com/global/40009768).

ORGANIZATIONS, NOTWITHSTANDING THE EXISTENCE OF SPECIFIC OPERATING STANDARDS IN EACH SUB-SECTOR. THESE COMPETENCIES COULD MIRROR THE SIXTEEN SEGMENTS CITED IN THIS REPORT, OR COULD BE CONDENSED AND DRAFTED TO MIRROR EXISTING OR DE-FACTO STANDARDS ALREADY IN PLACE. IN THIS WAY, ORGANIZATIONS COULD MEET ONE OR MULTIPLE COMPETENCIES BUT, ABOVE ALL, THEY WOULD BE EMPOWERED TO BRAND THEMSELVES WITH THIS MASTER CERTIFICATION. RATHER THAN TRYING TO CREATE AN EXISTING STANDARD, OR WORSE YET A NEW ORGANIZATION TO ENFORCE IT, A COMPLIANCE WITH STANDARDS IN A PARTICULAR COMPETENCY WOULD MEAN AUTOMATIC CERTIFICATION IN THAT COMPETENCY UNDER THE MASTER BRAND.

CERTAINLY, SOME HARD WORK WOULD HAVE TO BE DONE AND HARD DECISIONS MADE. FOR EXAMPLE, THE COMPETENCIES WOULD EACH HAVE TO INCLUDE MEASUREMENT MECHANISMS THAT WOULD ALLOW INTEGRATION WITH OTHER COMPETENCIES. FOR INSTANCE, IF A LEARNER HAD COMPLETED STUDIES AT A CERTAIN LEVEL OF ACADEMIC LANGUAGE COMPETENCY, FROM MATERIALS PRODUCED BY A PROVIDER IN A MATERIALS COMPETENCY, S/HE MIGHT WANT TO ENTER AN INDUSTRY-SPECIFIC HIGHER LEARNING PROGRAM AND THEREFORE WANT TO ESTABLISH WHETHER OR NOT THE TRAINING ALREADY RECEIVED WAS ADEQUATE, FROM A STANDPOINT OF WORKPLACE COMPETENCY, TO COMPLETE THE PROGRAM, OR WHETHER FURTHER TRAINING WERE REQUIRED. THIS WOULD CREATE A COMMON “LANGUAGE” TO THE END USERS OF LANGUAGE PRODUCTS AND SERVICES, MOST OF WHOM ARE VERY INTERESTED IN SOME TYPE OF WIDELY RECOGNIZED SCHEME BUT SIGNIFICANTLY LESS INTERESTED IN THE DETAILS.

IN ORDER TO WORK, THE BRAND’S COMPETENCIES WOULD HAVE TO BE RECOGNIZED BY ALL PROVIDERS, IN ORDER TO FACILITATE MOVEMENT THROUGH THE SYSTEM AND SOME LEVEL OF INTEGRATION AND POTENTIAL COOPERATION BETWEEN SECTORS SPECIALIZING IN DIFFERENT COMPETENCIES. AT THE PROVIDER LEVEL, THIS WOULD ENCOURAGE COMPLEMENTARY PARTNERSHIPS BETWEEN PROVIDERS WITH DIFFERING COMPETENCIES, BUT AT THE SAME TIME WOULD NOT PREVENT THEIR ADHERENCE TO EXISTING, AND IN SOME CASES MORE DEMANDING, STANDARDS SCHEMES. AT THE END USER LEVEL, THIS WOULD ALLOW A LEVEL OF ASSURANCE, SIMPLICITY, AND THE ABILITY TO PLAN THAT HAS ALWAYS BEEN MISSING FROM THE NATION’S LANGUAGE TRAINING INDUSTRY. THE APPLICATIONS OF AN INTEGRATED “LANGUAGE BRAND” ARE NUMEROUS; PRIOR LEARNING ASSESSMENT FOR THOSE HOPING TO COME TO CANADA TO SETTLE AND FIND WORK, INTERNATIONAL STUDENTS VISITING CANADA TO IMPROVE LANGUAGE SKILLS AND EITHER PURSUE HIGHER EDUCATION OR GAIN EMPLOYMENT, K-12 ESL AND FSL STUDENTS WORKING TOWARD LONG-TERM CAREER GOALS, AND IMMIGRANTS HOPING TO RECOGNIZE THE ENORMOUS POTENTIAL THAT THEIR NEW LIVES HAVE NOT YET PROVIDED THEM.

0.1.4. Speech Processing²²

0.1.4.1. *EUROMAP – AN EXAMPLE TO EMULATE*

EUROMAP’S MISSION: WE PROVIDE AWARENESS, BRIDGE-BUILDING AND MARKET-ENABLING SERVICES TO BOOST OPPORTUNITIES FOR MARKET TAKE-UP OF THE RESULTS OF EUROPEAN AND NATIONAL HUMAN LANGUAGE TECHNOLOGY (HLT) RESEARCH AND DEVELOPMENT ACTIVITIES. THE KEY FOCUS IS ON ACCELERATING THE RATE OF HLT TRANSFER FROM THE RESEARCH BASE TO THE MARKET BY CREATING COMMUNITIES OF INTEREST BETWEEN THE

²² THIS SECTION IS DRAWN FROM THE DOCUMENT *CANADIAN SPEECH PROCESSING INDUSTRY: TECHNOLOGY ROADMAP*, VERSION 1.1 (2004), PRODUCED BY THE SPEECH PROCESSING SUB-COMMITTEE, SECTION 8.1.

CRITICAL PLAYERS IN THE DEVELOPMENT AND VALUE CHAIN.

WE PROVIDE TARGETED CASE STUDIES TO ILLUSTRATE BEST PRACTICE IN TECHNOLOGY TRANSFER AND TAKE-UP. INITIALLY WE BUILD COMMUNITIES AND ESTABLISH EXPERTISE AT NATIONAL LEVEL, AND THEN EXTEND OUR BRIEF TO CROSS-BORDER ACTIVITIES THROUGHOUT EUROPE, INCLUDING ACCESSION COUNTRIES. WE WILL CAPITALIZE ON THE DYNAMICS, INTELLECTUAL CAPITAL AND SKILLS BASE GENERATED IN 4TH FRAMEWORK PROGRAMME EUROMAP PROJECTS TO CREATE A NEW EUROPEAN INFORMATION AND SUPPORT PLATFORM FOR ADDING VALUE TO NATIONAL AND EUROPEAN LEVEL HLT INITIATIVES.

WE WILL PRODUCE A MODULAR, ADAPTABLE HLT 'PATH TO MARKET' PACKAGE, TESTED AGAINST AT LEAST TWO USER SECTORS, AND PROVIDE USEFUL CASE STUDY AND CHANNEL MANAGEMENT MATERIAL THAT CAN BE RAPIDLY TAILORED TO NEW USER SECTORS AND NEW HLT PROJECTS THROUGHOUT EUROPE.

WE ALSO AIM TO:

- INCREASE THE NUMBER OF PROJECTS THAT DELIVER TESTED, READY-FOR-MARKET RESULTS.
- ACCELERATE AWARENESS OF POTENTIAL SOLUTIONS WITHIN THE TARGETED USER SECTORS
- ACCELERATE AWARENESS OF THE BENEFITS OF HLT WITHIN POLICY MAKING BODIES AND NATIONAL ADMINISTRATIONS
- BOOST THE NUMBER OF BEST-OF-CLASS TECHNOLOGY DEVELOPERS PARTICIPATING IN RESEARCH PROJECTS
- IMPROVE THE RELEVANCE OF PROJECT TARGETS TO TECHNOLOGY SUPPLIER/USER NEEDS
- IMPROVE THE MATCH BETWEEN HLT DESIGN AND SUPPLIER/END USER APPLICATION EXPECTATIONS
- ENABLE THE CREATION OF PARTNERSHIPS AND COMMUNITIES FOR BETA TESTING, DEMONSTRATION, REAL-TIME UTILIZATION MONITORING AND OTHER CLOSE-TO-MARKET APPLICATION ACTIVITIES.

WE WILL ALSO PRODUCE AND DISSEMINATE WHITE PAPERS, CASE STUDIES OF HLT TRANSFER SUCCESS STORIES, REPORTS ON BEST PRACTICE, DIRECTORIES OF PLAYERS, CONTACT DATABASES, ELECTRONIC FORUMS, AND PARTICIPATE IN NATIONAL AND CROSS-BORDER SECTOR EVENTS.²³

0.1.4.2. *RECOMMENDATIONS FROM THE SPEECH SUBSECTOR COMMITTEE*

1. PROVIDE AN OVERVIEW OF SPEECH TECHNOLOGY & TERMINOLOGY. THIS SHOULD INCLUDE BASIC CONCEPTS AND TERMS, KEY FEATURES OF SPEECH RECOGNITION TECHNOLOGY, KEY FEATURES OF TTS TECHNOLOGY, KEY FEATURES OF VOICE BIOMETRICS, STANDARDS (E.G. VOICEXML, SALT, SAPI, AURORA).
2. INVENTORY OF CANADIAN SPEECH PROCESSING TECHNOLOGY PROVIDERS, RESEARCHERS, AND ADAPTORS.

²³ [HTTP://WWW.HLTCENTRAL.ORG/PAGE-176.SHTML](http://www.hltcentral.org/page-176.shtml).

3. REPOSITORY AND INVENTORY FOR AUDIO DATA (CORPUS).
4. PROVIDE A CANADIAN HUMAN LANGUAGE TECHNOLOGIES' "WHO'S WHO" DIRECTORY WITH A BRIEF DESCRIPTION OF THEIR OFFERINGS, DEMONSTRATION NUMBERS, AND CONTACT INFORMATION.
5. PROVIDE AN INFORMATION PORTAL ON CANADIAN SPEECH TECHNOLOGY RESEARCH. GOAL IS TO PROVIDE A BRIDGE FROM RESEARCH TO COMMERCIALIZATION AND TO BOOST THE NUMBER OF BEST-IN-CLASS TECHNOLOGY, PLATFORM, AND APPLICATION DEVELOPERS PARTICIPATING IN RESEARCH PROJECTS.
6. FORUM TO FORM STRATEGIC ALLIANCES (E.G. INDUSTRY, UNIVERSITIES, GOVERNMENT).
7. FORUM TO INTERACT WITH THE OTHER LANGUAGE TECHNOLOGY PLAYERS (E.G. NATURAL LANGUAGE UNDERSTANDING, SEMANTIC MEANING EXTRACTION).
8. INFORMATION PORTAL ON BUSINESS AND RESEARCH FUNDING. SHOULD INCLUDE GOVERNMENT AND VENTURE CAPITAL INFO.
9. PROVIDE UP-TO-DATE NEWS AND EVENTS ON HUMAN LANGUAGE TECHNOLOGIES IN CANADA & AROUND THE WORLD.
10. PROVIDE LINKS TO OTHER USEFUL SITES (SPEECH ASSOCIATIONS, MARKET STUDIES, ETC.).
11. ATTEMPT TO STANDARDIZE SPEECH TECHNOLOGY EVALUATION METHODOLOGIES & METRICS.

0.1.5. Translation

AN INITIAL DEVELOPMENT STRATEGY HAS BEEN OUTLINED BY THE TRANSLATION SUB-COMMITTEE AS FOLLOWS:²⁴

- IMMEDIATE OBJECTIVE: IDENTIFY GAPS IN CANADIAN TRANSLATION INDUSTRY
 - GAPS IN TERMS OF PRODUCTS/FEATURES DEVELOPED IN CANADA
 - GAPS WITH REGARD TO TECHNOLOGY-RELATED SERVICES PROVIDED IN CANADA

SOME RELEVANT INFORMATION TO THIS EFFECT CAN BE FOUND IN THE TECHNOLOGY ROADMAP, IN A TABLE THAT ILLUSTRATES "CANADIAN TRANSLATION TECHNOLOGY PRODUCTS AND THEIR FEATURES," AND IN SECTION *THE TRANSLATION PROCESS CHALLENGE*.

0.1.6. Synopsis

0.1.6.1. SYNERGY

THE ISSUE THAT WE DISCUSS IN THIS SECTION UNDER THE GENERAL HEADING *SYNERGY* HAS BEEN RAISED ALMOST UNANIMOUSLY, IN VARIOUS INTERRELATED MANNERS, BY MOST PARTIES INVOLVED IN THE TECHNOLOGY ROADMAPPING PROCESS. AS IT WAS REMARKED AT THE OUTSET OF THE PRESENT DISCUSSION OF DEVELOPMENT STRATEGY, THE ISSUE OF LANGUAGE INDUSTRY FRAGMENTATION AND THE CORRESPONDING NEED TO STRENGTHEN THE TIES BETWEEN LANGUAGE INDUSTRIES WERE FORCEFULLY EMPHASIZED IN THE ACTION PLAN FOR OFFICIAL LANGUAGES.

ANALOGOUSLY, ALL THE DEVELOPMENT STRATEGIES OUTLINED BY THE DIFFERENT SUB-COMMITTEES EMPHASIZE THE SAME ISSUE. THE CONTENT MANAGEMENT SUB-COMMITTEE PROPOSES TO "CREATE A STRONG PROGRAMS OF SYNERGY BETWEEN THE LARGE COMPANIES, THE SMES AND THE R&D LABS AND ACADEMIA," AND TO "CONVENE A COLLABORATIVE FORUM WITH

²⁴ SOURCE: POWERPOINT PRESENTATION FROM MARCH 2004 MEETING.

LARGE COMPANIES, SMES, ACADEMIA AND GOVERNMENT RESEARCH LABS TO HELP SET THE AGENDA FOR THE CM INDUSTRY IN CANADA.” THE LANGUAGE TRAINING SUB-COMMITTEE STATES THAT “GREATER COMMUNICATION BETWEEN INDUSTRY SEGMENTS AND SECTORS WILL RESULT IN A LARGE NUMBER OF PARTNERSHIP AND INTEGRATION OPPORTUNITIES, WHICH WILL SPUR THE DEVELOPMENT OF LANGUAGE TECHNOLOGIES,” AND SUGGEST SOME POTENTIAL PATHS FOR COLLABORATION RESULTING FROM BETTER COMMUNICATION. THE SPEECH PROCESSING SUB-COMMITTEE POINTS TO THE MODEL OF EUROMAP, AN INSTITUTION WHICH INCLUDES IN ITS MISSION THE TASK OF “CREATING COMMUNITIES OF INTEREST BETWEEN THE CRITICAL PLAYERS IN THE DEVELOPMENT AND VALUE CHAIN.” ACCORDINGLY, THE INITIAL RECOMMENDATIONS FROM THE SPEECH PROCESSING SUB-COMMITTEE INCLUDE THE CREATION OF A “FORUM TO FORM STRATEGIC ALLIANCES” AND A “FORUM TO INTERACT WITH THE OTHER LANGUAGE TECHNOLOGY PLAYERS.” IN THE SAME VEIN, AILIA’S MANDATE INCLUDES AMONG ITS TASKS TO BECOME A FORUM FOR INDUSTRY MEMBERS, TO FACILITATE NETWORKING BETWEEN THE INDUSTRY AND PUBLIC- AND PRIVATE SECTOR PARTNERS, AND TO SUPPORT THE EMERGENCE OF ALLIANCES AND PROJECTS TO GROW THE INDUSTRY.

REFERENCES TO THE PROBLEM OF LANGUAGE INDUSTRY FRAGMENTATION AND TO POSSIBLE WAYS OF ALLEVIATING IT CAN BE FOUND AT SEVERAL POINTS IN THE TECHNOLOGY ROADMAP. FOR FURTHER INSIGHTS ON THE ISSUE, THE FOLLOWING SECTIONS ARE RELEVANT: *THE FOUR SUB SECTORS INTERRELATED*, *ECONOMIC FIGURES AND COURSE OF ACTION*, *FRAGMENTATION AND WHAT IS DONE TO PREVENT IT*, *CROSS-SECTOR COMMUNICATION*, *FRAGMENTATION & STANDARDIZATION*.

FROM A MORE SPECIFIC TECHNOLOGICAL PERSPECTIVE, THE ISSUE OF SYNERGY UNDERLIES A NUMBER OF RELEVANT TECHNOLOGY ATTRIBUTES, SUCH AS *CROSS-OVER*, *INTEROPERABILITY*, AND *STANDARDS*, EACH OF WHICH IS BRIEFLY DISCUSSED BELOW IN A SEPARATE SUBSECTION.

IN GENERAL, THE EXTENT OF THE CONSENSUS ON THE NEED FOR SYNERGY AND THE DEGREE OF EMPHASIS PLACED ON THIS ISSUE, IN TERMS OF BOTH DEVELOPMENT SUPPORT STRATEGY AND TECHNOLOGY DEVELOPMENT, MAKE THE ISSUE OF SYNERGY THE FOREMOST DRIVER OF THE PRESENT TECHNOLOGY ROADMAP. WHICH CONCRETE FORM THE EFFORT TOWARDS SYNERGY SHOULD PRACTICALLY TAKE WILL BE A KEY SUBJECT TO BE ADDRESSED IN THE REST OF THE PRESENT DEVELOPMENT STRATEGY DISCUSSION.

0.1.6.1.1. Cross-over

AS WE HAVE SEEN, THE ATTRIBUTE OF *CROSS-OVER*, ALONG WITH THE RELATED ATTRIBUTE OF *APPLICABILITY* OF ONE SECTOR TO ANOTHER, HAS BEEN IDENTIFIED AS CRITICAL BY ALL SUB-COMMITTEES. HOWEVER, THE TERM TENDS TO BE USED IN RELATED BUT DIFFERENT WAYS. IT IS USEFUL TO PRELIMINARILY DISTINGUISH AT LEAST THREE WAYS IN WHICH SUCH A TERM IS USED, ALL OF WHICH WILL BE RELEVANT IN THE SUBSEQUENT DISCUSSION.

1. IN A FIRST SENSE, *CROSS-OVER* CAN BE INTENDED AS AN OVERLAP IN THE SCOPE OF TWO DIFFERENT SECTORS. FOR EXAMPLE, SPEECH-TO-SPEECH TRANSLATION CAN BE OBVIOUSLY INCLUDED IN THE SCOPE OF BOTH SPEECH PROCESSING AND TRANSLATION. THIS KIND OF *CROSS-OVER* CAN BE GENERALLY ASSUMED TO HOLD BETWEEN APPLICATIONS. AT THIS LEVEL, *CROSS-OVER* RESULTS FROM THE BROADER OR NARROWER WAY IN WHICH THE SCOPE OF DIFFERENT SECTORS IS DEFINED. HOWEVER, RATHER THAN BEING SIMPLY A MATTER OF CONVENTION, SUCH OVERLAPS ARE SIGNIFICANT INDICATORS OF COMMONALITY OF INTERESTS BETWEEN DIFFERENT SECTORS.
2. IN A SECOND SENSE, *CROSS-OVER* CAN RESULT FROM A GIVEN TECHNOLOGY BEING EQUALLY

RELEVANT TO DIFFERENT SECTORS. FOR EXAMPLE, NATURAL LANGUAGE UNDERSTANDING IS RELEVANT TO BOTH CONTENT MANAGEMENT AND TRANSLATION. THIS WOULD BE TRUE EVEN IF THERE WAS NO OVERLAP IN THE RESPECTIVE SCOPE DEFINITIONS OF THE TWO SECTORS. HOWEVER, THIS SENSE OF CROSS-OVER SHARES WITH THE PREVIOUS ONE THE CHARACTER OF A SYMMETRICAL RELATION BETWEEN THE SECTORS INVOLVED. BOTH KINDS OF CROSS-OVER COULD BE GRAPHICALLY REPRESENTED AS HORIZONTAL. HOWEVER, UNLIKE THE PREVIOUS KIND OF CROSS-OVER, THIS ONE HOLDS BETWEEN TECHNOLOGIES RATHER THAN BETWEEN APPLICATIONS.

3. A THIRD SENSE IS RELATED TO THE IMPORTANT DISTINCTION BETWEEN TECHNOLOGIES AND APPLICATIONS, AS INTRODUCED BY SOME OF THE SUB-COMMITTEES, AND WIDELY ACCEPTED IN THE DISCUSSION COMPRISING THE TECHNOLOGY ROADMAPPING PROCESS. A TECHNOLOGY FROM ONE SECTOR CAN BE RELEVANT TO AN APPLICATION IN A DIFFERENT SECTOR. FOR EXAMPLE, *SPEECH PROCESSING ASSISTED LANGUAGE TRAINING* WOULD BE A CASE IN POINT, WITH SPEECH PROCESSING TECHNOLOGY BEING USED IN A LANGUAGE TRAINING APPLICATION. THIS SORT OF CROSS-OVER IS ASYMMETRICAL IN NATURE, AS IT STANDS BETWEEN TWO SECTORS THAT ARE RESPECTIVELY REGARDED AS A GIVER AND A RECEIVER OF TECHNOLOGY. IN GRAPHICAL TERMS, THIS COULD BE REPRESENTED AS A VERTICAL KIND OF CROSS-OVER, WHICH HOLDS BETWEEN TECHNOLOGIES AND APPLICATIONS.

ON THE NOTE OF CROSS-OVER AS A KEY CRITICAL ATTRIBUTE, IT SHOULD BE NOTED THAT, IN ADDITION TO FOSTERING SYNERGY, THE MAXIMIZATION OF CROSS-OVER IS ALSO AN EFFECTIVE WAY TO AVOID COMMITTING TECHNOLOGY DEVELOPMENT TO A SINGLE TECHNOLOGICAL PATH. BY DEVELOPING TECHNOLOGY THAT CAN BE USEFUL TO VARIOUS SECTORS, MULTIPLE TECHNOLOGICAL PATHS ARE KEPT SIMULTANEOUSLY OPEN.

0.1.6.1.2. Interoperability

A DISCUSSION OF THE KEY NOTION OF *INTEROPERABILITY* AND ITS ADVANTAGES IS CONTAINED IN THE PRESENTATION *TOWARDS A LANGUAGE TECHNOLOGY SERVICES INFRASTRUCTURE* BY MICHEL MELLINGER (INSTITUTE FOR INFORMATION TECHNOLOGY, NRC). THE PRESENT SECTION BRIEFLY SUMMARIZES SOME OF THE KEY POINTS MADE IN THAT PRESENTATION.

SOME 15-20 YEARS AGO BUSINESS INFORMATION BECAME ACCESSIBLE IN THE WORLD OF DATABASES. AT THE TIME SEVERAL PROPRIETARY ENVIRONMENTS EXISTED, AND NUMEROUS SPECIFIC INTERFACES EXISTED TO MOVE FROM ONE ENVIRONMENT TO ANOTHER, RESULTING IN A VERY EXPENSIVE SITUATION FOR USERS. VENDORS AGREED TO DEVELOP INTEROPERABILITY BETWEEN THEIR ENVIRONMENTS, AND THEY DEVELOPED STANDARDS AND SPECIFICATIONS. INTEROPERABILITY BROUGHT MANY BENEFITS, INCLUDING THE FOLLOWING: DATA AND APPLICATIONS BECAME SEPARATE; IT BECAME POSSIBLE FOR THIRD PARTIES TO DEVELOP APPLICATIONS, AND DEVELOPER'S TOOLKITS WERE PRODUCED; IT BECAME POSSIBLE TO DEVELOP DATABASE SOFTWARE, SUCH AS ORACLE, INFORMIX, dBASE; AS A RESULT, THE INTERNET IS NOW USED FOR B2B, SERVICES, ETC.

BASED ON THIS AND OTHER SUCCESSFUL PRECEDENTS, AN INTEROPERABLE SERVICES INFRASTRUCTURE FOR LANGUAGE TECHNOLOGY IS PROPOSED, BASED ON A THREE-LAYER ARCHITECTURE COMPRISING CLIENT SERVICES, APPLICATION SERVICES, AND DATA SERVICES. IT IS ARGUED THAT BOTH THE LT INDUSTRY AND THE LT CLIENTS WOULD BENEFIT FROM THIS INFRASTRUCTURE, WHICH WOULD ALLEVIATE MANY OF THE CURRENT PROBLEMS. CURRENTLY, 80% OF THE LT INDUSTRY COMPRISES SMALL COMPANIES, WITH LESS THAN TWENTY-FIVE PEOPLE;

LARGE INVESTMENTS INTO LANGUAGE RESOURCES REQUIRE MANY YEARS; INNOVATIVE, GOOD TECHNOLOGIES REMAIN LOCAL; AND THE INTEGRATION OF TOOLS IS DIFFICULT. FOR LT CLIENTS IT IS PROBLEMATIC TO CHOOSE THE BEST AMONG MANY AVAILABLE TOOLS; INTEGRATING TOOLS IS TIME-CRITICAL, DUE TO THEIR LACK OF TRANSPARENCY; AND IN MANY CASES SMALL-SIZE CLIENTS CANNOT AFFORD TO BUY CURRENT TECHNOLOGY.

IT IS ARGUED THAT AN INTEROPERABLE SERVICES INFRASTRUCTURE WOULD BENEFIT ALL DOMAINS OF THE LANGUAGE TECHNOLOGIES INDUSTRY, AS WELL AS CUSTOMERS IN ALL SUB-SECTORS:

- TRANSLATION: LINGUISTIC RESOURCES, TRANSLATION SUPPORT
- CONTENT MANAGEMENT: REPOSITORIES FOR MULTILINGUAL AND MULTICULTURAL RESOURCES, DOCUMENT LIFE CYCLE SUPPORT, SEMANTIC SEARCH FOR MULTIPLE LANGUAGES
- SPEECH: SPEECH RECOGNITION, SPEECH PROCESSING, TEXT/SPEECH-TO-SPEECH/TEXT TOOLS
- TRAINING: COURSE CONTENT MANAGEMENT, ASSESSMENT TOOLS, DISTANCE EDUCATION SUPPORT

0.1.6.1.3. Standards

THE ISSUE OF STANDARDS IS RELATED TO THAT OF INTEROPERABILITY, AND TO THE MORE GENERAL PROBLEM OF OVERCOMING FRAGMENTATION. A DISCUSSION OF STANDARDIZATION AND ITS RELATION TO THE BARRIER OF FRAGMENTATION, WITH SPECIFIC REFERENCE TO THE LANGUAGE TRAINING SECTOR, IS CONTAINED IN SECTIONS *APPLICATIONS OF MODELS TO CANADIAN LANGUAGE TRAINING PROVIDERS* AND *CHALLENGES TO CANADA FOR IMPLEMENTING THESE MODELS* OF THE TECHNOLOGY ROADMAP.

THE DEVELOPMENT STRATEGY OUTLINES PROVIDED BY SEVERAL SUB-COMMITTEES GIVE PROMINENCE TO STANDARDIZATION. THE LANGUAGE TRAINING SUB-COMMITTEE'S ADVOCACY OF BRANDING IS A CASE IN POINT: A BRANDING PROCESS NECESSARILY INVOLVES SOME LEVEL OF STANDARDIZATION, AND THE PROCESS ITSELF AIMS AT ASSURING CONSUMERS THAT AN ORGANIZATION CAN PROVIDE A LEVEL OF SERVICE CONFORMING TO A RECOGNIZED STANDARD. THE CONTENT MANAGEMENT SUB-COMMITTEE ALSO ADVOCATES THE ADOPTION OF STANDARDS, SUCH AS XML, WHICH "WILL GUARANTEE CANADIAN CITIZENS A HIGH LEVEL OF CUSTOMER SERVICE AND WILL BE CONDUCIVE TO THE INTERCHANGE OF INFORMATION IN THE USE OF CM TECHNOLOGIES." THE SPEECH PROCESSING SUB-COMMITTEE RECOMMENDS UNDERTAKING AN EFFORT IN THE DIRECTION OF STANDARDIZING SPEECH TECHNOLOGY EVALUATION METHODOLOGIES AND METRICS.

FURTHERMORE, STANDARDS COMPLIANCE HAS BEEN INCLUDED BY ALL SUB-COMMITTEES AMONG THE CRITICAL ATTRIBUTES FOR THEIR SUB-SECTOR, THUS PROVIDING FURTHER EVIDENCE OF THE RELEVANCE OF THIS ISSUE.

0.1.6.2. VISIBILITY

THE SECOND OUTSTANDING ISSUE POINTED OUT IN THE ACTION PLAN FOR OFFICIAL LANGUAGES, AND THEREFORE THE SECOND STRATEGIC PRIORITY FOR THE LANGUAGE INDUSTRY, IS *VISIBILITY*. HERE TOO THERE APPEAR TO BE A WIDE CONSENSUS IN THE LANGUAGE INDUSTRY SUB-SECTORS ABOUT THE RELEVANCE OF THE PROBLEM. FOR EXAMPLE, LACK OF RECOGNITION OF THE CANADIAN LANGUAGE INDUSTRY IS IDENTIFIED AS A PROMINENT PROBLEM BY THE LANGUAGE TRAINING SUB-COMMITTEE, WHICH ADVOCATES BRANDING AS A WAY OF OVERCOMING THE PROBLEM. LIKewise, THE SPEECH PROCESSING SUB-COMMITTEE ACKNOWLEDGES THAT THE MAIN BARRIER STANDING BETWEEN MANY MAINSTREAM CORPORATIONS OBJECTIVELY CONSIDERING THE

SPEECH RECOGNITION OPPORTUNITY IS ONE OF LIMITED KNOWLEDGE AND AWARENESS. AGAIN, AILIA'S MANDATE INCLUDES AMONG ITS TASKS RAISING THE VISIBILITY OF THE INDUSTRY. IN THE PRESENT CONTEXT, THE ISSUE IS MORE RELEVANT IN TERMS OF DEVELOPMENT SUPPORT STRATEGY, IN ORDER TO PROMOTE TECHNOLOGIES THAT HAVE REACHED A SATISFACTORY DEGREE OF MATURITY, THAN IN TERMS OF TECHNOLOGY DEVELOPMENT.

0.1.6.3. *ECONOMIC IMPACT*

THE *ECONOMIC IMPACT* OF NEW TECHNOLOGY IS PROMINENTLY FEATURED AMONG THE CRITICAL ATTRIBUTES SELECTED BY ALL SUB-COMMITTEES. IN ADDITION TO THE EVALUATION OF *NATIONAL AND INTERNATIONAL MARKET OPPORTUNITIES*, TWO OTHER RELEVANT ATTRIBUTES HAVE BEEN UNANIMOUSLY SELECTED BY ALL SUB-COMMITTEES: *DEVELOPMENT COST*, AND *END-USER RETURN-ON-INVESTMENTS (ROI)*.

0.1.6.4. *SOFTWARE CATEGORIZATION*

0.1.6.4.1. Applications vs. technology components

IN OUTLINING THEIR TARGETED PRODUCTS—AND, ACCORDINGLY, IN LISTING THEIR CRITICAL ATTRIBUTES—SOME SUB-COMMITTEES, NAMELY SPEECH PROCESSING AND TRANSLATION, HAVE INTRODUCED A CRUCIAL DISTINCTION BETWEEN APPLICATIONS AND TECHNOLOGY COMPONENTS. THE SAME DISTINCTION HAS ALSO BEEN ADVOCATED ELSEWHERE DURING THE ROADMAPING PROCESS, AND WILL BE ADOPTED IN THE REST OF THE PRESENT DEVELOPMENT STRATEGY DISCUSSION. THE INTRODUCTION OF SUCH A DISTINCTION BY SOME SUB-COMMITTEES BUT NOT BY OTHERS IS ONE OF THE REASONS WHY DISPARITIES CAN BE FOUND IN THE SETS OF CRITICAL ATTRIBUTES PROVIDED BY THE VARIOUS SUB-COMMITTEES, WHICH ARE NOT ENTIRELY COMPARABLE. HOWEVER, RATHER THAN BEING CONSIDERED A SHORTCOMING TO BE OVERCOME, SUCH DISPARITIES SHOULD BE REGARDED AS AN INDICATOR OF THE DIFFERENT NATURE OF THE SUB-SECTORS. IN PARTICULAR, AS ALREADY HINTED EARLIER ON, A CRUCIAL DISTINCTION CAN BE DRAWN BETWEEN SECTORS, SUCH AS SPEECH PROCESSING, WHICH ARE GIVERS OF TECHNOLOGY, AND OTHERS, SUCH AS LANGUAGE TRAINING, WHICH ARE RECEIVERS OF TECHNOLOGY.

SUCH A DISTINCTION BETWEEN SECTORS CAN BE LEVERAGED FROM IN TERMS OF ASYMMETRICAL CROSS-OVER, AS PREVIOUSLY DESCRIBED. IN OTHER WORDS, INSTEAD OF PRIORITIZING TECHNOLOGY BY CRITERIA THAT PUT DIFFERENT SUB-SECTORS ON A FOOT OF EQUALITY AND IN A COMPETITIVE RELATIONSHIP, A DISTINCTION BETWEEN GIVERS AND RECEIVERS OF TECHNOLOGY CAN BE PRELIMINARILY IMPOSED ON THE RELEVANT SECTORS, AND THEN USED AS A SORT OF CONSTRAINT, OR REQUIREMENT, OR FILTER, TO EVALUATE ALTERNATIVE SCENARIOS. SCENARIOS THAT PRELIMINARILY SATISFY THE ASYMMETRIC CROSS-OVER REQUIREMENT—FOR EXAMPLE BY PROPOSING THE USE OF SPEECH PROCESSING TECHNOLOGY IN LANGUAGE TRAINING APPLICATIONS—SHOULD THEN BE FURTHER EVALUATED ON THE BASIS ON THEIR ADDITIONAL MAXIMIZATION OF OTHER FORMS OF CROSS-OVER, AS WELL AS OTHER CRITICAL ATTRIBUTES.

0.1.6.4.2. Resources

THE IMPORTANCE OF LINGUISTIC RESOURCES IS EMPHASIZED BY SOME SUB-COMMITTEES, WHOSE SUB-SECTORS EITHER ARE PARTICULARLY RESOURCE-INTENSIVE, OR PERCEIVE THE CURRENT AVAILABILITY OF LINGUISTIC RESOURCES AS INADEQUATE. THE INCLUSION OF RESOURCES AS A SPECIFIC CATEGORY AMONG THEIR TARGETED PRODUCTS BY SOME SUB-COMMITTEES, NAMELY CONTENT MANAGEMENT AND LANGUAGE TRAINING, CAN BE REGARDED AS AN IMPLICIT PRIORITIZATION OF LINGUISTIC RESOURCES IN THEIR PROPOSALS FOR A DEVELOPMENT STRATEGY.

INDEED, IN THE CONTENT MANAGEMENT SUB-COMMITTEE'S DISCUSSION OF THE *PRESENT STATE OF THE CANADIAN CM INDUSTRY* IN THE TECHNOLOGY ROADMAP, A DIVERSE RANGE OF RELEVANT LANGUAGE RESOURCES IS LISTED, AND A REFERENCE IS MADE TO THE SITUATION IN THIS RESPECT AS "NOT IDEAL, ESPECIALLY WITH REGARD TO FRENCH RESOURCES," FOR A VARIETY OF REASONS WHICH ARE EXPLAINED THEREIN. A REFERENCE TO RESOURCES IS ALSO MADE IN THE SPEECH PROCESSING SUB-COMMITTEE'S OUTLINE OF A DEVELOPMENT STRATEGY, WHERE THE CREATION OF A REPOSITORY AND INVENTORY FOR AUDIO DATA IS RECOMMENDED.

AS POINTED OUT IN THE ACTION PLAN FOR OFFICIAL LANGUAGES, IT SHOULD BE NOTED THAT LINGUISTIC DUALITY GIVES CANADA A COMPETITIVE ADVANTAGE IN THE DEVELOPMENT OF RESOURCES, BY FOSTERING THE CREATION OF LANGUAGE-RESOURCES THAT ARE LANGUAGE-SPECIFIC BUT NOT NATION-SPECIFIC.²⁵

CONSIDERATIONS OF CROSS-OVER ISSUES ARE EQUALLY—IF NOT EVEN MORE—RELEVANT FOR LANGUAGE RESOURCES AS FOR TECHNOLOGY AND APPLICATIONS. HERE, TOO, SOME SORT OF DIVISION OF LABOUR COULD BE DEvised AMONG SUB-SECTORS, IN ADDITION TO WHAT WAS HINTED ABOVE FOR TECHNOLOGY AND APPLICATIONS.

0.1.6.5. *CONCLUDING REMARKS*

IN SUM, ONE OF THE POSSIBLE SCENARIOS COMPATIBLE WITH THE DEVELOPMENT STRATEGY SUGGESTIONS OUTLINED BY THE VARIOUS SUB-COMMITTEES, IS ONE WHERE A TOP-LEVEL DISTINCTION BETWEEN TECHNOLOGICAL DEVELOPMENT AND DEVELOPMENT SUPPORT STRATEGY IS MADE, WITH THE FORMER CHIEFLY FOCUSING ON OVERCOMING LANGUAGE INDUSTRY FRAGMENTATION, AND THE LATTER FOCUSING ON OVERCOMING THE LANGUAGE INDUSTRY LACK OF VISIBILITY, POSSIBLY THROUGH A BRANDING PROCESS.

WITH RESPECT TO TECHNOLOGICAL DEVELOPMENT, A THREE-FOLD DISTINCTION BETWEEN TECHNOLOGIES, APPLICATIONS, AND RESOURCES COULD BE MADE. ACCORDINGLY, A CORRESPONDING DIVISION OF LABOUR AND RESPONSIBILITIES BETWEEN SUB-SECTORS COULD BE FORESEEN. FURTHERMORE, A TWO-STEP TECHNOLOGY DEVELOPMENT STRATEGY COULD BE DEvised, WHEREAS A PRELIMINARY DISTRIBUTION OF ROLES AMONG SUB-SECTORS WOULD BE AGREED UPON, WITH THE INTRODUCTION OF A DISTINCTION BETWEEN TECHNOLOGY GIVERS, TECHNOLOGY RECEIVERS, RESOURCE DEVELOPERS, ETC. TARGETED APPLICATIONS WOULD BELONG TO TECHNOLOGY-RECEIVING SECTORS, WHILE TARGETED TECHNOLOGY WOULD BELONG TO TECHNOLOGY-GIVING SECTORS, THUS AIMING AT THE MAXIMIZATION OF VERTICAL CROSS-OVER.

SUCH A PRELIMINARY CROSS-OVER SCHEME COULD BE USED AS A FILTER FOR THE FURTHER EVALUATION OF TECHNOLOGICAL DEVELOPMENT ALTERNATIVES. EVALUATION AND PRIORITIZATION METRICS FOR CANDIDATE APPLICATIONS, TECHNOLOGIES, AND RESOURCES THAT FIT THE PRELIMINARY SCHEME WOULD BE PROMINENTLY FOCUSING ON CRITICAL ATTRIBUTES ON WHICH CONSENSUS EXISTS AMONG THE VARIOUS SUB-COMMITTEES, SUCH AS HORIZONTAL CROSS-OVER—IN TERMS OF BOTH TECHNOLOGY CROSS-OVER AND SECTOR SCOPE DEFINITION CROSS-OVER FOR APPLICATIONS—ECONOMIC IMPACT, AND THE PROMOTION OF STANDARDIZATION.

²⁵ SEE ALSO A REFERENCE TO THIS IDEA IN THE MINUTES OF THE LANGUAGE TECHNOLOGY ROADMAP WORKING SESSION, MONTRÉAL, MARCH 10, 2005.

1. Technology Development Strategy

1.1. EVALUATION AND PRIORITIZATION OF TECHNOLOGIES

THE TASK OF EVALUATING AND PRIORITIZING TECHNOLOGIES IS THUS DESCRIBED BY INDUSTRY CANADA:

HAVING SPECIFIED THE TECHNOLOGY DRIVERS AND CORRESPONDING TARGETS, PARTICIPANTS BEGIN IDENTIFYING THE TECHNOLOGY ALTERNATIVES WITH THE POTENTIAL TO MEET THOSE TARGETS. A DIFFICULT TARGET MAY REQUIRE BREAKTHROUGHS IN SEVERAL TECHNOLOGIES, OR A TECHNOLOGY MAY IMPACT MULTIPLE TARGETS. FOR EACH OF THE IDENTIFIED TECHNOLOGY ALTERNATIVES, THE ROADMAPPING PROCESS FORECASTS A TIME LINE OF THE MATURING OF THE TECHNOLOGY—ITS PROGRESS TOWARDS MEETING THE DRIVER TARGETS.

IF NO PARTICULAR TECHNOLOGY EMERGES AS THE CLEAR WINNER FOR THE FUTURE, THE PARTICIPANTS MIGHT CONSIDER R&D ON SEVERAL TECHNOLOGY ALTERNATIVES IN PARALLEL. WHEN MULTIPLE TECHNOLOGY ALTERNATIVES ARE TO BE PURSUED, THE ROADMAP'S TIMELINES MUST IDENTIFY DECISION POINTS, WHEN THE IMPLEMENTATION GROUP WILL CONSIDER WHETHER THE TECHNOLOGY IS A FRONT-RUNNING PROSPECT OR SHOULD BE DROPPED FROM FURTHER CONSIDERATION.²⁶

1.1.1. Criteria for evaluation and prioritization

IN THIS SECTION A FEW SETS OF EVALUATION AND PRIORITIZATION CRITERIA PUT FORWARD BY INTERESTED PARTIES DURING THE ROADMAPPING PROCESS ARE PRELIMINARILY LISTED FOR FURTHER REFERENCE DURING THE EVALUATION AND PRIORITIZATION DISCUSSION.

1.1.1.1. PROPOSED CRITERIA

- a) FROM *CONTENT MANAGEMENT CHAIR'S PRESENTATION AT SUB-COMMITTEE CHAIRS MEETING IN MONTRÉAL, MARCH 10, 2005*:
 - FEASIBILITY
 - MATURITY TIMING
 - CANADIAN STRENGTHS
 - MARKETING PROSPECTS
- b) FROM *NOTES FROM THE CONTENT MANAGEMENT SUB-COMMITTEE MARCH 2004 BREAKOUT SESSION*
 - LARGE MARKET: 8
 - COLLABORATION: 6
 - SHOWCASE / SEXY / SIZZLE: 4
 - FAVOURABLE POSITIONING: 3
 - LONG TERM IMPACT ON CANADIAN ECONOMY: 3
- c) FROM *CROSS-COMMITTEE BRAINSTORMING #2 AT TRM MEETING IN OTTAWA: MARCH 23, 2004*:

²⁶ PRODUCING A TECHNOLOGY ROADMAP (ACCESSED ON OCT. 31, 2005 AT [HTTP://STRATEGIS.IC.GC.CA/EPIC/INTERNET/INTRM-CRT.NSF/EN/RM00060E.HTML](http://strategis.ic.gc.ca/epic/internet/intrm-crt.nsf/en/rm00060e.html), SECTION 2, DEVELOPMENT OF THE TECHNOLOGY ROADMAP, SUBSECTION IDENTIFY TECHNOLOGY ALTERNATIVES AND THEIR DEVELOPMENT TIMELINES.

- MARKET SIZE & PROFITABILITY (SHORT VS. LONG-TERM)
 - ABILITY OF TECHNOLOGY TO ENHANCE PRODUCTIVITY
 - ABILITY OF TECHNOLOGY TO INCREASE CANADA’S INTERNATIONAL COMPETITIVENESS
 - ABILITY OF TECHNOLOGY TO TAP INTO CANADA’S COMPETITIVE ADVANTAGE
 - POTENTIAL TO USE TECHNOLOGY FROM A RANGE OF SUBSECTORS (I.E. TRANSLATION, SPEECH PROCESSING, CONTENT MANAGEMENT ETC.)
 - FEASIBILITY OF IMPLEMENTATION
 - SHORT-TERM VS. LONG-TERM RETURN/REVENUE GENERATION
- d) FROM *NOTES POUR LE COS DU CRTL*, BY MICHEL MELLINGER:

PLANNING FOR OPTIMAL TECHNOLOGY IMPACT, COMPRISING FOUR STEPS AND PRIORITIZATION:

- CLASSIFY THE *TECHNOLOGY* INTO ITS *COMPONENTS*.
- LIST THE *APPLICATION AREAS*.
- DETERMINE THE MOST PROBABLE *SCENARIO* WHICH WILL *FURTHER ENHANCE IMPACT* (THESE ARE NOT NECESSARILY MUTUALLY EXCLUSIVE): COMMERCIALIZATION, RESEARCH, PUBLIC DISSEMINATION.
- CREATE A LIST OF POTENTIAL *PARTIES* WHO COULD HELP US ENHANCE THE IMPACT OF THE TECHNOLOGY, I.E. RECEPTORS AND/OR COLLABORATORS FOR COMMERCIALIZATION, FOR RESEARCH OR FOR PUBLIC DISSEMINATION.

FROM *MINUTES OF THE LANGUAGE TECHNOLOGY ROADMAP WORKING SESSION – OTTAWA, NOV. 9, 2005*:

e) SET OF PROJECT PRIORITIZATION CRITERIA IS PROPOSED BY MARTIN DUCHAINE:

- POTENTIAL IMPACT IN THE CANADIAN INDUSTRY
- POTENTIAL MARKET ADDRESSED
- POSSIBILITY TO CREATE A CONSORTIUM—RESEARCH, PUBLIC, AND INDUSTRIAL—TO SUPPORT THE PROPOSED PROJECTS
- POSSIBILITY TO GET FINANCING—RESEARCH, PUBLIC OR INDUSTRIAL
- USABLE INDUSTRIAL RESULTS IN THE SHORT (LESS THAN ONE YEAR), MIDDLE (BETWEEN ONE AND TWO YEARS) OR LONG TERM (OVER TWO YEARS)

f) SET OF PROJECT PRIORITIZATION CRITERIA IS PROPOSED BY PIERRE DUMOUCHEL:

- PROBABILITY OF OBTAINING FUNDING FROM RELEVANT AGENCIES
- QUALITY OF PEOPLE INVOLVED
- NEEDS FILLED BY THE PROJECT
- TECHNOLOGY INVOLVED

1.1.1.2. SYNOPSIS

THE VARIOUS CRITERIA PROPOSED CAN BE CLASSIFIED IN THREE GROUPS:

1. CRITERIA THAT MATCH AN ATTRIBUTE USED IN THE EVALUATION RESULTS, AS SHOWN IN SECTION *GENERAL EVALUATION*. THESE INCLUDE, E.G., MARKET OPPORTUNITIES AND CROSS-OVER.
2. CRITERIA THAT DON’T MATCH EXACTLY ATTRIBUTES BEING USED IN THE EVALUATION, BUT FOR WHICH THERE ARE EITHER SINGLE ATTRIBUTES OR COMBINATIONS OF ATTRIBUTES THAT ARE GOOD APPROXIMATION TO THE CRITERION UNDER CONSIDERATION. FOR EXAMPLE, THERE IS NO “FEASIBILITY” ATTRIBUTE IN THE EVALUATION, BUT THE ATTRIBUTE “DEVELOPMENT COST”

MIGHT BE TAKEN AS A GOOD INDICATOR OF THE FEASIBILITY OF A TECHNOLOGY; LIKEWISE “IMPACT SCENARIO” COULD BE LIKENED TO “REVENUE MODEL.”

3. CRITERIA FOR WHICH NO MATCHING ATTRIBUTE CAN BE FOUND, SUCH AS “POTENTIAL PARTIES,” AND “QUALITY OF PEOPLE INVOLVED.”

THE FIRST TWO CLASSES SEEM TO COVER A MAJORITY OF CRITERIA LISTED ABOVE. THEREFORE IT CAN BE ARGUED THAT, WITH A LITTLE INGENUITY, SOME MAPPING BETWEEN MOST SETS OF CRITERIA AND CORRESPONDING COMBINATIONS OF ATTRIBUTES IN USE CAN BE FOUND. HOWEVER, ONE PROBLEM MIGHT BE THAT SEVERAL ATTRIBUTES CONTAIN GAPS, AS THEY HAVE NOT BEEN UNIFORMLY USED BY ALL SUB-COMMITTEES.

AS FOR THE MINORITY OF UNMATCHED CRITERIA, IT SHOULD BE NOTED THAT SEVERAL OF THESE, SUCH AS “POTENTIAL PARTIES,” “QUALITY OF PEOPLE INVOLVED” AND “NEEDS FILLED BY THE PROJECT,” WOULD NOT BE AMENABLE TO A QUANTITATIVE REPRESENTATION. THEREFORE, THEIR ADOPTION WOULD LIKELY IMPLY MOVING AWAY FROM QUANTITATIVE METRICS TOWARDS MORE SUBJECTIVE EVALUATIONS.

FINALLY, THE PROPOSAL TO “CLASSIFY THE *TECHNOLOGY* INTO ITS *COMPONENTS*,” WHICH IS NOT CURRENTLY COVERED BY THE EVALUATION DATA, IS NOT QUANTITATIVE IN ITSELF, BUT IT COULD BE THE BASIS OF A COMBINED QUANTITATIVE EVALUATION BASED ON CLUSTERS OF RELATED SOFTWARE RATHER THAN ON SINGLE ITEMS. THIS PROPOSAL WILL BE FURTHER DISCUSSED LATER IN THIS DOCUMENT.

1.1.2. Evaluation of technologies

1.1.2.1. *GENERAL EVALUATION*²⁷

THE PRESENT SECTION SUMMARIZES THE EVALUATION RESULTS PROVIDED BY THE VARIOUS SUB-COMMITTEES ABOUT THE RESPECTIVE TARGETED SOFTWARE, USUALLY IN THE FORM OF SPREADSHEETS. THE GOAL OF THE SECTION IS TO PROVIDE A SYNOPTIC VIEW OF THE SAME RESULTS, AS UNIFORMLY AS POSSIBLE, SO AS TO MAKE CROSS-COMPARISONS POSSIBLE.

THE DATA PROVIDED IN THIS SECTION SHOULD BE REGARDED AS THE CORE INFORMATION UPON WHICH TECHNOLOGY PRIORITIZATION SHOULD REST. WHAT THIS MEANS IS NOT SO MUCH THAT THE INFORMATION CONTAINED HEREIN IS EXHAUSTIVE. ON THE CONTRARY, VARIOUS INTEGRATIONS AND EXTENSIONS WOULD BE POSSIBLE AND FORESEEABLE. HOWEVER, IT IS RECOMMENDED THAT THE INTEGRATION OF FURTHER INFORMATION BE MADE IN SUCH A WAY THAT THE ADDITIONAL INFORMATION CAN BE ACCOMMODATED IN THE FRAMEWORK PROVIDED BY THE PRESENT SECTION.

IN THE SPIRIT OF TECHNOLOGY ROADMAPPING AS A DYNAMIC PROCESS RATHER THAN A STATIC SET OF RESULTS, THE DATA ARE PROVIDED IN SUCH A FORM AS TO MAKE THEM AMENABLE TO FURTHER PROCESSING AND MANIPULATION. TO THIS END, UNIFORMITY OF PRESENTATION WAS PRIORITIZED OVER READABILITY OF THE DATA. SPECIFICALLY, THE DATA ARE PROVIDED IN THE FORM OF A SINGLE, LARGE TABLE THAT CAN BE EASILY IMPORTED INTO A SPREADSHEET OR A DATABASE, SO AS TO MAKE IT POSSIBLE TO FURTHER MANIPULATE THE DATA BY SORTING, FILTERING, ADDING FORMULAS TO EXTRACT FURTHER INFORMATION, ETC., WHEREAS READABILITY WOULD HAVE SUGGESTED TO BREAK THE DATA INTO A SET OF SEPARATE TABLES, AND PERHAPS TO REPLACE AN EVALUATION IN TERMS OF BARE NUMERICAL CODES WITH A MORE INTUITIVE AND SELF-EXPLANATORY ONE.

²⁷ DATA FROM: GRAHAM RUSSELL, *LANGUAGE TECHNOLOGY ROADMAP STATUS REPORT* (MARCH 2005).

AS ALREADY MENTIONED, THERE EXIST DISPARITIES AMONG THE EVALUATION DATA PROVIDED BY THE VARIOUS SUB-COMMITTEES. THE DISPARITIES PARTLY CONSIST IN THE USE OF ALTOGETHER DIFFERENT ATTRIBUTES, AS THE TECHNOLOGY ROADMAP SHOWS IN THE TABLE CONTAINING THE SYNOPTIC VIEW OF THE CRITICAL ATTRIBUTES SELECTED FOR EACH SUB-SECTOR. ANOTHER SOURCE OF DISPARITY IS THE USE OF DIFFERENT EVALUATION SCALES FOR THE SAME CRITICAL ATTRIBUTE, OR FOR ANALOGOUS ONES. NEVERTHELESS, IN THE SPIRIT OF INTEGRATION AND UNIFORMITY, IT WAS CHOSEN TO USE THE UNION OF ALL CRITICAL ATTRIBUTES FOR ALL SOFTWARE UNDER EVALUATION, WITH THE RESULT OF HAVING MANY GAPS IN THE TABLE, WHENEVER A CRITICAL ATTRIBUTE IS NOT APPLICABLE TO AN ITEM.

TABLE 1 BELOW IS A COMPLETE LIST OF THE CRITICAL ATTRIBUTES BEING CONSIDERED. AN EXPLANATION OF THE EVALUATION METRICS IN USE IS ASSOCIATED WITH EACH ATTRIBUTE. IN THE CASE OF SHARED ATTRIBUTES FOR WHICH DIFFERENT METRICS WERE USED IN DIFFERENT SUB-SECTORS, A NORMALIZATION EFFORT WAS MADE IN THE PRESENT TABLE, IN ORDER TO MAKE EVALUATION UNIFORM ACROSS SUB-SECTORS. AT THE SAME TIME THE ORIGINAL EVALUATION SCALES WERE PRESERVED AS MUCH AS POSSIBLE, IN ORDER TO MAKE BACK-REFERENCE TO THE ORIGINAL TABLES AS STRAIGHTFORWARD AS POSSIBLE. IN ORDER TO RECONCILE THE NORMALIZATION AND THE PRESERVATION EFFORTS, NON-INTEGER VALUES WERE INTRODUCED FOR SOME ATTRIBUTES. SPECIFICALLY, THIS WAS DONE FOR THE ATTRIBUTE *END-USER RETURN ON INVESTMENTS*, WHERE THREE DISTINCT FOUR-POINT SCALES WERE MERGED AND NORMALIZED INTO A SINGLE TEN-POINT SCALE, WHICH STILL RANGES FROM ZERO TO FIVE ONLY. IN THE SAME EFFORT TO MINIMIZE THE CHANGES TO THE ORIGINAL EVALUATION SCALES, NO NORMALIZATION WAS APPLIED TO VALUES ACROSS DIFFERENT ATTRIBUTES. FOR EXAMPLE, THE ATTRIBUTE *LANGUAGE TRAINING SPECIFICITY*, WHICH RANGES FROM ZERO TO THREE, WAS LEFT UNCHANGED, ALTHOUGH THE EVALUATION SCALES FOR ALL OTHER ATTRIBUTES START AT ONE.

Attribute	Interpretation	Evaluation scale					
		0	1	2	3	4	5
<i>TIME TO MARKET</i>	YEAR (NNNN)	N/A	N/A	N/A	N/A	N/A	N/A
<i>NATIONAL MARKET</i>	OPPORTUNITY ANNUAL VALUE IN EXCESS OF X	N/A	\$100,000	\$1 M.	\$10 M.	\$100 M.	N/A
<i>INTERNATIONAL MARKET</i>	OPPORTUNITY ANNUAL VALUE IN EXCESS OF X	N/A	\$1 M.	\$10 M.	\$100 M.	\$1,000 M.	N/A
<i>EASE OF USE</i>	APPROXIMATE TRAINING TIME OF X	N/A	ONE MONTH	ONE WEEK	ONE DAY	ONE HOUR	N/A
<i>EASE OF INTEGRATION</i>	APPROXIMATELY X	N/A	ONE MONTH	ONE WEEK	ONE DAY	ONE HOUR	N/A
<i>MODEL DEVELOPMENT</i>	APPROXIMATELY X	N/A	ONE MONTH	ONE WEEK	ONE DAY	ONE HOUR	NONE REQUIRED
<i>GRAMMAR DEVELOPMENT</i>	APPROXIMATELY X	N/A	ONE MONTH	ONE WEEK	ONE DAY	ONE HOUR	NONE REQUIRED
<i>DEVELOPMENT COST</i>		N/A	\$10 M.	\$1 M.	\$100,000	\$10,000	N/A
<i>ENHANCEMENTS</i>	ADDITIONAL CUSTOMIZATION/LEARNING X TIME REQUIRED APPROXIMATELY	N/A	NONE	ONE HOUR	ONE WEEK	1-5 MONTHS	6+ MONTHS
<i>END-USER RETURN ON INVESTMENT</i>	COST RECOVERED IN X	N/A	TEN YEARS	FIVE YEARS [MOREOVER: 2.2 = 3+ YEARS; 2.4 = >2 YEARS; 2.6 = 2 YEARS; 2.8 = 1-2 YEARS]	ONE YEAR; [MOREOVER: 3.5 = SIX MONTHS]	TWO MONTHS	ONE MONTH
<i>STANDARDS COMPLIANCE</i>		N/A	NO EXISTING STANDARD	CONSISTENT WITH SOME CURRENT STANDARD	CONSISTENT WITH DE FACTO STANDARD	COMPATIBLE WITH EXISTING INDUSTRY	N/A
<i>LIFETIME</i>	PRODUCT LIFETIME OF X	N/A	LESS THAN ONE YEAR	ONE YEAR	FIVE YEARS	TEN YEARS	N/A
<i>CROSS-OVER</i>	USEFUL FOR X OTHER SUBSECTORS	N/A	0	1	2	3	N/A
<i>APPLICABILITY TO SUBSECTOR X</i>	X = {LT, Tr, SP, CM}	N/A	NO APPLICATIONS	FUTURE APPLICATIONS	IMMEDIATE APPLICATIONS	ALREADY IN USE	N/A
<i>APPLICATIONS & TOOLS</i>	RELEVANT TO X	N/A	N/A	ONE OR TWO APPLICATIONS	SEVERAL APPLICATIONS	NUMEROUS APPLICATIONS	N/A
<i>EXISTING STRENGTHS</i>	CANADA'S CURRENT POSITION	N/A	DEVELOPING	SIGNIFICANT EXPERIENCE	WELL-ESTABLISHED PLAYER	INTERNATIONAL LEADER	N/A
<i>LANGUAGE TRAINING SPECIFICITY</i>		NO EXISTING APPLICATION TO LT	SOME APPLICATIONS TO LT	PRIMARILY APPLIED TO LT	N/A	N/A	N/A
<i>REVENUE MODEL</i>		N/A	ADVERTISING	SUBSCRIPTION	LICENSING	PRODUCT SALES	SERVICE
<i>MATURITY</i>		N/A	EMERGING, NOT COMMERCIALLY VIABLE	EMERGING, HEAVILY TAILORED FOR APPLICATIONS	MATURE, CUSTOMIZED	MATURE, COMPONENT WARE	N/A

TABLE 1. LEGEND FOR SOFTWARE EVALUATION TABLE (TABLE 2 BELOW).

TABLE 2 BELOW CONTAINS THE EVALUATION DATA. IN ORDER TO VISUALLY EMPHASIZE THE DISTINCTION BETWEEN APPLICATIONS, RESOURCES, TOOLS, AND TECHNOLOGY, THE FOUR SOFTWARE CATEGORIES ARE SHOWN IN DIFFERENT COLOURS. EACH ITEM UNDER EVALUATION IS ASSOCIATED WITH A PROGRESSIVE NUMERICAL ID, WHICH MAKES IT EASIER TO MAKE REFERENCES TO THE ITEM IN THE REST OF THE DOCUMENT. ASIDE FROM NORMALIZATION, THE VALUES ARE EXACTLY THE SAME PROVIDED BY EACH SUB-COMMITTEE IN THE SOURCE SPREADSHEETS. EVEN IN CASES WHERE ADDITIONAL INFORMATION THAT COULD HAVE GONE INTO THE TABLE WAS SEPARATELY PROVIDED BY A SUB-COMMITTEE IN SOME OTHER FORM, IT WAS CHOSEN NOT TO INCLUDE THE ADDITIONAL INFORMATION IN THE TABLE FOR THE SAKE OF UNIFORMITY WITH THE ORIGINAL SPREADSHEETS, AND TO REPORT THE ADDITIONAL INFORMATION ELSEWHERE IN THIS DOCUMENT. THE ONLY EXCEPTION IS THE ATTRIBUTE *CROSS-OVER* FOR SPEECH PROCESSING AND TRANSLATION TECHNOLOGIES. IN THIS CASE, THE ORIGINAL *APPLICABILITY* ATTRIBUTES WERE MAPPED ONTO THE *CROSS-OVER* ATTRIBUTE, SINCE THE MAPPING WAS RELATIVELY STRAIGHTFORWARD. HOWEVER, THE ADDED VALUES ARE GRAYED-OUT, IN ORDER TO DISTINGUISH THEM FROM THE OTHER VALUES.

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	TIME TO MARKET	NATIONAL MARKET	INTERNATIONAL MARKET	EASE OF USE	EASE OF INTEGRATION	MODEL DEVELOPMENT	GRAMMAR DEVELOPMENT	DEVELOPMENT COST	ENHANCEMENTS	END-USER RETURN ON INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	CROSS-OVER	APPLICABILITY TO LANGUAGE TRAINING	APPLICABILITY TO TRANSLATION	APPLICABILITY TO SPEECH PROCESSING	APPLICABILITY TO CONTENT MANAGEMENT	APPLICATIONS & TOOLS	EXISTING STRENGTHS	LANGUAGE TRAINING SPECIFICITY	REVENUE MODEL	MATURITY
1	CM	APP.	CLIR	2008	3	3	N/A	N/A	N/A	N/A	1	N/A	3	2	3	2	N/A	N/A	N/A	N/A	N/A	1	N/A	N/A	N/A
2	CM	APP.	DIALOGUE	2010	4	4	N/A	N/A	N/A	N/A	1	N/A	3	2	3	2	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
3	CM	APP.	INTELLIGENT SPEECH-TO-TEXT	2014	4	4	N/A	N/A	N/A	N/A	1	N/A	3	2	3	2	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
4	CM	APP.	MULTILING. QA	2010	4	4	N/A	N/A	N/A	N/A	1	N/A	3	2	3	2	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
5	CM	APP.	UNSTRUC. IR	2008	4	4	N/A	N/A	N/A	N/A	1	N/A	3	2	3	2	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
6	CM	APP.	TEXT ANALYTICS	2008	4	4	N/A	N/A	N/A	N/A	1	N/A	3	2	3	1	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
7	CM	APP.	TEXT GENERATOR	2012	4	4	N/A	N/A	N/A	N/A	1	N/A	3	2	3	3	N/A	N/A	N/A	N/A	N/A	1	N/A	N/A	N/A
8	CM	RES.	MULTILINGUAL TERMINOLOGIES	2007	1	1	N/A	N/A	N/A	N/A	2	N/A	2	2	4	4	N/A	N/A	N/A	N/A	N/A	3	N/A	N/A	N/A
9	CM	RES.	ONTOLOGIES	2013	1	1	N/A	N/A	N/A	N/A	2	N/A	2	2	4	4	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
10	CM	RES.	PARALLEL CORPORA	2009	1	1	N/A	N/A	N/A	N/A	3	N/A	2	2	4	4	N/A	N/A	N/A	N/A	N/A	3	N/A	N/A	N/A
11	CM	RES.	WRITTEN CORPORA	2006	1	1	N/A	N/A	N/A	N/A	3	N/A	2	2	4	4	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
12	CM	TOOL	ONTOLOGY ACQ./MAINT.	2008	1	1	N/A	N/A	N/A	N/A	2	N/A	2	2	4	4	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
13	CM	TOOL	TERMINOLOGY ACQ./MAINT.	2008	1	1	N/A	N/A	N/A	N/A	3	N/A	2	2	4	4	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
14	LT	RES.	WEB SITE WITH LESSON PLAN RESOURCES FOR TEACHERS AND/OR ACTIVITY RESOURCES FOR STUDENTS	N/A	1	2	4	N/A	N/A	N/A	3	N/A	3	1	3	3	N/A	N/A	N/A	N/A	N/A	N/A	2	1	4

<i>PROGR. ID</i>	<i>SUBSECTOR</i>	<i>TYPE OF SOFTWARE</i>	<i>SOFTWARE</i>	<i>TIME TO MARKET</i>	<i>NATIONAL MARKET</i>	<i>INTERNATIONAL MARKET</i>	<i>EASE OF USE</i>	<i>EASE OF INTEGRATION</i>	<i>MODEL DEVELOPMENT</i>	<i>GRAMMAR DEVELOPMENT</i>	<i>DEVELOPMENT COST</i>	<i>ENHANCEMENTS</i>	<i>END-USER RETURN ON INVESTMENT</i>	<i>STANDARDS COMPLIANCE</i>	<i>LIFETIME</i>	<i>CROSS-OVER</i>	<i>APPLICABILITY TO LANGUAGE TRAINING</i>	<i>APPLICABILITY TO TRANSLATION</i>	<i>APPLICABILITY TO SPEECH PROCESSING</i>	<i>APPLICABILITY TO CONTENT MANAGEMENT</i>	<i>APPLICATIONS & TOOLS</i>	<i>EXISTING STRENGTHS</i>	<i>LANGUAGE TRAINING SPECIFICITY</i>	<i>REVENUE MODEL</i>	<i>MATURITY</i>
15	LT	RES.	SUBSCRIPTION WEB SITE PROVIDING ONLINE LEARNING MATERIALS FOR TEACHERS, AND MATCHING A NATIONAL CURRICULUM	N/A	3	3	2	N/A	N/A	N/A	2	N/A	2	4	4	2	N/A	N/A	N/A	N/A	N/A	N/A	1	2	2
16	LT	RES.	MAJOR MEDIA OUTLETS WITH EDUCATION NEWS AND RESOURCES	N/A	3	3	3	N/A	N/A	N/A	3	N/A	2	3	3	2	N/A	N/A	N/A	N/A	N/A	N/A	1	1	2
17	LT	RES.	GLOBAL INTERNET NETWORKS PARTNERING LANGUAGE LEARNERS WITH EACH OTHER	N/A	2	3	2	N/A	N/A	N/A	3	N/A	2	1	3	3	N/A	N/A	N/A	N/A	N/A	N/A	1	4	3
18	LT	RES.	INTERNET DIRECTORIES OF STUDY-ABROAD OPPORTUNITIES FOR DOMESTIC AND INTERNATIONAL STUDENTS	N/A	3	3	4	N/A	N/A	N/A	3	N/A	2	1	3	2	N/A	N/A	N/A	N/A	N/A	N/A	1	1	4
19	LT	RES.	ONLINE LITERATURE LIBRARIES WITH INDIVIDUAL VOCABULARY LINKS AND/OR SPEECH MODELING	N/A	2	2	3	N/A	N/A	N/A	3	N/A	1	1	4	4	N/A	N/A	N/A	N/A	N/A	N/A	1	1	2
20	LT	RES.	ONLINE REPOSITORIES OF INFORMATION ON THE LANGUAGE TRAINING INDUSTRY, WITH CONSULTING	N/A	2	2	4	N/A	N/A	N/A	3	N/A	2	3	2	3	N/A	N/A	N/A	N/A	N/A	N/A	0	4	2
21	LT	RES.	STANDARDS-BASED TEACHER RESOURCE TO HELP TEACHERS WITH TECHNOLOGY USE	N/A	3	3	1	N/A	N/A	N/A	1	N/A	2	4	4	1	N/A	N/A	N/A	N/A	N/A	N/A	0	3	2

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	TIME TO MARKET	NATIONAL MARKET	INTERNATIONAL MARKET	EASE OF USE	EASE OF INTEGRATION	MODEL DEVELOPMENT	GRAMMAR DEVELOPMENT	DEVELOPMENT COST	ENHANCEMENTS	END-USER RETURN ON INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	CROSS-OVER	APPLICABILITY TO LANGUAGE TRAINING	APPLICABILITY TO TRANSLATION	APPLICABILITY TO SPEECH PROCESSING	APPLICABILITY TO CONTENT MANAGEMENT	APPLICATIONS & TOOLS	EXISTING STRENGTHS	LANGUAGE TRAINING SPECIFICITY	REVENUE MODEL	MATURITY
22	LT	RES.	MULTILINGUAL DICTIONARY SOFTWARE ON CELL PHONE OR PDA FOR TRANSLATION AND LANGUAGE TRAINING	N/A	3	4	3	N/A	N/A	N/A	2	N/A	2	1	3	4	N/A	N/A	N/A	N/A	N/A	N/A	1	4	2
23	LT	RES.	SUBSCRIPTION-BASED RESOURCE SITES SPECIFICALLY FOR ESL TEACHERS	N/A	2	3	3	N/A	N/A	N/A	3	N/A	2	3	3	2	N/A	N/A	N/A	N/A	N/A	N/A	2	2	2
24	LT	RES.	ONLINE DICTIONARIES	N/A	2	2	4	N/A	N/A	N/A	3	N/A	1	1	4	4	N/A	N/A	N/A	N/A	N/A	N/A	1	1	3
25	LT	RES.	INTERACTIVE DICTIONARIES	N/A	2	2	4	N/A	N/A	N/A	4	N/A	2	3	3	2	N/A	N/A	N/A	N/A	N/A	N/A	1	4	3
26	LT	RES.	COMPANION WEBSITE TO TEXTBOOKS/TEXT ENRICHMENT SITES/ONLINE COURSE SUPPORT	N/A	2	2	3	N/A	N/A	N/A	3	N/A	1	3	3	2	N/A	N/A	N/A	N/A	N/A	N/A	1	4	3
27	LT	TOOL	MULTILINGUAL CD-BASED OR ONLINE LANGUAGE LEARNING SOFTWARE	N/A	3	3	3	N/A	N/A	N/A	2	N/A	2	3	3	2	N/A	N/A	N/A	N/A	N/A	N/A	2	4	4
28	LT	TOOL	STORYBOARD ROLE-PLAY SOFTWARE FOR CHILDREN	N/A	3	3	2	N/A	N/A	N/A	2	N/A	1	4	3	3	N/A	N/A	N/A	N/A	N/A	N/A	1	4	2
29	LT	TOOL	FULL SUBSCRIPTION-BASED ONLINE ENGLISH COURSES	N/A	3	4	2	N/A	N/A	N/A	2	N/A	2	3	3	2	N/A	N/A	N/A	N/A	N/A	N/A	2	2	4
30	LT	TOOL	SKILL-SPECIFIC (I.E. PRONUNCIATION, LISTENING) SOFTWARE, CD-BASED OR ONLINE	N/A	2	3	3	N/A	N/A	N/A	2	N/A	2	1	2	2	N/A	N/A	N/A	N/A	N/A	N/A	2	2	2
31	LT	TOOL	GAME-BASED SOFTWARE ON CD FOR LANGUAGE LEARNING	N/A	3	3	4	N/A	N/A	N/A	2	N/A	1	4	2	3	N/A	N/A	N/A	N/A	N/A	N/A	1	4	2

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	TIME TO MARKET	NATIONAL MARKET	INTERNATIONAL MARKET	EASE OF USE	EASE OF INTEGRATION	MODEL DEVELOPMENT	GRAMMAR DEVELOPMENT	DEVELOPMENT COST	ENHANCEMENTS	END-USER RETURN ON INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	CROSS-OVER	APPLICABILITY TO LANGUAGE TRAINING	APPLICABILITY TO TRANSLATION	APPLICABILITY TO SPEECH PROCESSING	APPLICABILITY TO CONTENT MANAGEMENT	APPLICATIONS & TOOLS	EXISTING STRENGTHS	LANGUAGE TRAINING SPECIFICITY	REVENUE MODEL	MATURITY
32	LT	TOOL	TRAVELLING PHRASEBOOK SOFTWARE FOR IPOD	N/A	3	3	3	N/A	N/A	N/A	2	N/A	2	1	3	3	N/A	N/A	N/A	N/A	N/A	N/A	1	4	2
33	LT	TOOL	LANGUAGE LEARNING SYSTEMS WITH MULTIMEDIA TOOLS (VIDEO, RECORDING, INTERACTIVE TESTS)	N/A	3	4	2	N/A	N/A	N/A	1	N/A	2	3	3	2	N/A	N/A	N/A	N/A	N/A	N/A	2	3	4
34	LT	TOOL	IMMERSIVE ENVIRONMENTS FOR SPECIFIC TASK-RELATED LANGUAGE LEARNING	N/A	2	3	2	N/A	N/A	N/A	1	N/A	3	4	2	3	N/A	N/A	N/A	N/A	N/A	N/A	2	4	1
35	LT	TOOL	ONLINE VOCABULARY ASSESSMENT AND DEVELOPMENT TOOLS	N/A	2	2	4	N/A	N/A	N/A	3	N/A	1	4	3	3	N/A	N/A	N/A	N/A	N/A	N/A	2	3	2
36	LT	TOOL	LANGUAGE LEARNING TOOLS DELIVERED ON MOBILE DEVICES	N/A	3	4	3	N/A	N/A	N/A	2	N/A	3	3	3	3	N/A	N/A	N/A	N/A	N/A	N/A	1	4	2
37	LT	TOOL	ONLINE LANGUAGE TRAINING TOOL SUPPORTED BY PEER-TO-PEER LEARNER AND TRAINER INTERACTION	N/A	2	3	3	N/A	N/A	N/A	3	N/A	1	4	3	2	N/A	N/A	N/A	N/A	N/A	N/A	2	4	2
38	LT	TOOL	TELEVISION/RADIO DELIVERY OF LANGUAGE TRAINING CONTENT BACKED BY STUDY MATERIALS	N/A	3	4	2	N/A	N/A	N/A	1	N/A	2	3	4	1	N/A	N/A	N/A	N/A	N/A	N/A	2	4	3
39	LT	TOOL	GRAMMAR CHECKING SOFTWARE FOR CORPORATE COMMUNICATION	N/A	3	3	2	N/A	N/A	N/A	2	N/A	3	1	3	3	N/A	N/A	N/A	N/A	N/A	N/A	1	4	1
40	LT	TOOL	ACCREDITED HOME STUDY PROGRAMS	N/A	3	2	2	N/A	N/A	N/A	2	N/A	2	4	3	2	N/A	N/A	N/A	N/A	N/A	N/A	2	2	2

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	TIME TO MARKET	NATIONAL MARKET	INTERNATIONAL MARKET	EASE OF USE	EASE OF INTEGRATION	MODEL DEVELOPMENT	GRAMMAR DEVELOPMENT	DEVELOPMENT COST	ENHANCEMENTS	END-USER RETURN ON INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	CROSS-OVER	APPLICABILITY TO LANGUAGE TRAINING	APPLICABILITY TO TRANSLATION	APPLICABILITY TO SPEECH PROCESSING	APPLICABILITY TO CONTENT MANAGEMENT	APPLICATIONS & TOOLS	EXISTING STRENGTHS	LANGUAGE TRAINING SPECIFICITY	REVENUE MODEL	MATURITY
41	LT	TOOL	ONLINE PRACTICE TOOLS FOR STANDARDIZED ASSESSMENT	N/A	3	4	3	N/A	N/A	N/A	2	N/A	2	4	2	2	N/A	N/A	N/A	N/A	N/A	N/A	2	4	4
42	LT	TOOL	ISSUE-BASED INTERACTIVE SOFTWARE	N/A	3	3	3	N/A	N/A	N/A	3	N/A	2	2	3	2	N/A	N/A	N/A	N/A	N/A	N/A	2	4	2
43	LT	TOOL	ONLINE TEXTBOOKS	N/A	3	3	1	N/A	N/A	N/A	1	N/A	2	3	3	2	N/A	N/A	N/A	N/A	N/A	N/A	2	4	4
44	LT	TOOL	STAND-ALONE COMPUTER LANGUAGE ASSESSMENT TOOLS	N/A	2	3	3	N/A	N/A	N/A	2	N/A	3	3	3	1	N/A	N/A	N/A	N/A	N/A	N/A	2	4	3
45	LT	TOOL	SPECIAL-PURPOSE ONLINE LANGUAGE TRAINING	N/A	3	3	3	N/A	N/A	N/A	3	N/A	3	2	3	2	N/A	N/A	N/A	N/A	N/A	N/A	2	2	2
46	LT	TOOL	FREWARE / SHAREWARE TOOLS AVAILABLE FOR COST-EFFECTIVE LICENSE	N/A	2	2	3	N/A	N/A	N/A	4	N/A	2	1	3	2	N/A	N/A	N/A	N/A	N/A	N/A	1	3	2
47	LT	TOOL	BUSINESS COMMUNICATION SOFTWARE	N/A	3	3	3	N/A	N/A	N/A	3	N/A	3	1	3	1	N/A	N/A	N/A	N/A	N/A	N/A	1	4	3
48	LT	TOOL	INDUSTRY-SPECIFIC LANGUAGE TRAINING SOFTWARE	N/A	2	3	2	N/A	N/A	N/A	2	N/A	3	3	3	2	N/A	N/A	N/A	N/A	N/A	N/A	2	4	2
49	LT	TOOL	TECHNOLOGY-ENABLED ASSESSMENT FOR EMPLOYMENT CERTIFICATION	N/A	2	2	2	N/A	N/A	N/A	3	N/A	3	4	4	2	N/A	N/A	N/A	N/A	N/A	N/A	1	5	2
50	LT	APP./PL.	APPLICATIONS FOR DELIVERY OF FULLY CUSTOMIZED ONLINE LANGUAGE TRAINING SCHOOL	N/A	3	3	1	N/A	N/A	N/A	1	N/A	3	3	3	2	N/A	N/A	N/A	N/A	N/A	N/A	2	3	3
51	LT	APP./PL.	HOSTING AND SUPPORT OF E-LEARNING PROGRAMS	N/A	3	3	1	N/A	N/A	N/A	2	N/A	3	4	3	4	N/A	N/A	N/A	N/A	N/A	N/A	1	3	3
52	LT	APP./PL.	VIRTUAL DIGITAL LANGUAGE LABORATORIES	N/A	3	3	1	N/A	N/A	N/A	2	N/A	2	3	3	3	N/A	N/A	N/A	N/A	N/A	N/A	2	4	3

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53	LT	APP./PL.	ONLINE PROFESSIONAL DEVELOPMENT RESOURCES FOR TEACHERS AND ADMINISTRATORS	N/A	3	3	1	N/A	N/A	N/A	1	N/A	2	4	3	2	N/A	N/A	N/A	N/A	N/A	N/A	1	3	2
54	LT	APP./PL.	SPEECH ANALYSIS AND FEEDBACK SOFTWARE ON MOBILE DEVICES	N/A	3	4	3	N/A	N/A	N/A	2	N/A	2	2	3	2	N/A	N/A	N/A	N/A	N/A	N/A	2	2	2
55	LT	APP./PL.	ONLINE ASSESSMENT SYSTEMS FOLLOWING NATIONAL STANDARDS	N/A	2	3	4	N/A	N/A	N/A	2	N/A	2	4	3	4	N/A	N/A	N/A	N/A	N/A	N/A	2	3	2
56	LT	APP./PL.	SUBSCRIPTION-BASED ONLINE LANGUAGE LEARNING APPLICATIONS FOR MOBILE DEVICES	N/A	2	3	4	N/A	N/A	N/A	3	N/A	2	3	2	3	N/A	N/A	N/A	N/A	N/A	N/A	2	2	2
57	LT	APP./PL.	TEXT TO SPEECH APPLICATIONS	N/A	2	2	4	N/A	N/A	N/A	3	N/A	2	1	3	3	N/A	N/A	N/A	N/A	N/A	N/A	1	3	2
58	LT	APP./PL.	ASSESSMENT AUTHORIZING APPLICATIONS	N/A	2	2	2	N/A	N/A	N/A	3	N/A	3	2	3	2	N/A	N/A	N/A	N/A	N/A	N/A	1	4	3
59	LT	APP./PL.	ONLINE TESL COURSES	N/A	3	3	2	N/A	N/A	N/A	3	N/A	4	3	3	1	N/A	N/A	N/A	N/A	N/A	N/A	2	4	3
60	LT	APP./PL.	COURSEWARE AUTHORIZING TOOLS/LEARNING MANAGEMENT SYSTEMS	N/A	4	4	1	N/A	N/A	N/A	1	N/A	2	4	4	2	N/A	N/A	N/A	N/A	N/A	N/A	1	4	4
61	LT	APP./PL.	SKILL-SPECIFIC APPLICATIONS DEVELOPED ACCORDING TO NATIONAL STANDARDS	N/A	3	3	1	N/A	N/A	N/A	2	N/A	2	4	3	2	N/A	N/A	N/A	N/A	N/A	N/A	1	3	3

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62	LT	APP./PL.	ASSESSMENT AND PROGRESS MANAGEMENT SYSTEMS DEVELOPED ACCORDING TO NATIONAL STANDARDS	N/A	3	3	1	N/A	N/A	N/A	2	N/A	2	4	3	2	N/A	N/A	N/A	N/A	N/A	N/A	0	3	3
63	SP	TECHNO L.	SPEECH RECOGNITION / EMBEDDED	N/A	3	3	N/A	2	1	1	N/A	N/A	3	4	4	4	4	4	N/A	4	4	N/A	N/A	N/A	4
64	SP	TECHNO L.	SPEECH RECOGNITION / SPEAKER DEP.	N/A	3	3	N/A	1	4	4	N/A	N/A	4	4	4	4	4	4	N/A	4	3	N/A	N/A	N/A	4
65	SP	TECHNO L.	SPEECH RECOGNITION / SPEAKER INDEP.	N/A	3	3	N/A	2	5	4	N/A	N/A	3	4	4	4	4	4	N/A	4	4	N/A	N/A	N/A	4
66	SP	TECHNO L.	SPEECH RECOGNITION / LARGE VOCAB.	N/A	3	3	N/A	N/A	1	1	N/A	N/A	3	3	4	4	2	3	N/A	4	4	N/A	N/A	N/A	3
67	SP	TECHNO L.	SPEECH RECOGNITION / NOISY ENVTS	N/A	2	2	N/A	4	1	3	N/A	N/A	2	2	3	4	2	3	N/A	4	4	N/A	N/A	N/A	3
68	SP	TECHNO L.	SPEECH RECOGNITION / AUDIO MINING	N/A	2	2	N/A	2	1	3	N/A	N/A	2	3	3	2	1	1	N/A	4	3	N/A	N/A	N/A	2
69	SP	TECHNO L.	SPEECH RECOGNITION / TOPIC SPOTTING	N/A	2	2	N/A	4	1	3	N/A	N/A	2	2	2	4	2	3	N/A	4	4	N/A	N/A	N/A	2
70	SP	TECHNO L.	SPEECH RECOGNITION / PROFICIENCY ANALYSIS	N/A	2	2	N/A	1	1	1	N/A	N/A	2	1	2	2	4	1	N/A	1	2	N/A	N/A	N/A	2
71	SP	TECHNO L.	SPEECH RECOGNITION / LIP READING	N/A	1	1	N/A	1	1	3	N/A	N/A	2	1	1	4	2	2	N/A	2	3	N/A	N/A	N/A	1
72	SP	TECHNO L.	SPEECH-TO-TEXT / SYNTHESIS	N/A	3	3	N/A	1	5	4	N/A	N/A	4	4	4	4	4	4	N/A	4	4	N/A	N/A	N/A	4
73	SP	TECHNO L.	SPEECH-TO-TEXT / CONCAT.	N/A	3	3	N/A	1	5	4	N/A	N/A	4	4	4	4	4	4	N/A	4	4	N/A	N/A	N/A	4
74	SP	TECHNO L.	VOICE BIOMETRICS / SPEAKER ID	N/A	2	2	N/A	4	5	3	N/A	N/A	3	3	4	4	2	2	N/A	4	3	N/A	N/A	N/A	3
75	SP	TECHNO L.	VOICE BIOMETRICS / SPEAKER VERIF.	N/A	2	2	N/A	4	5	4	N/A	N/A	3	3	4	3	2	1	N/A	4	3	N/A	N/A	N/A	3
76	SP	TECHNO L.	VOICE BIOMETRICS / LIE DETECTION	N/A	1	1	N/A	1	1	3	N/A	N/A	2	1	2	4	2	4	N/A	2	3	N/A	N/A	N/A	2

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77	SP	TECHNO L.	SIGNAL PROCESSING / AUDIO CLASSIF.	N/A	2	1	N/A	2	1	2	N/A	N/A	2	2	3	4	2	2	N/A	4	3	N/A	N/A	N/A	2	
78	SP	TECHNO L.	SIGNAL PROCESSING / SPEECH COMPRESSION	N/A	4	4	N/A	4	1	1	N/A	N/A	4	4	4	4	4	4	N/A	4	4	N/A	N/A	N/A	4	
79	SP	TECHNO L.	NATURAL LANGUAGE PROCESSING / GENERATION	N/A	2	1	N/A	2	5	3	N/A	N/A	2	1	3	4	3	3	N/A	2	3	N/A	N/A	N/A	2	
80	SP	TECHNO L.	NATURAL LANGUAGE PROCESSING / CONVERS. AGENTS	N/A	1	1	N/A	2	1	2	N/A	N/A	2	1	1	4	2	2	N/A	2	4	N/A	N/A	N/A	1	
81	SP	APP.	CALL CENTRES, WEB PORTALS	N/A	3	3	4	N/A	N/A	N/A	2	N/A	4	4	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
82	SP	APP.	INTERACTIVE VOICE RESPONSE	N/A	3	4	4	N/A	N/A	N/A	3	N/A	4	4	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A
83	SP	APP.	DIRECTORY ASSISTANCE	N/A	3	3	4	N/A	N/A	N/A	1	N/A	3	4	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A
84	SP	APP.	OUTBOUND DIALLING	N/A	3	3	4	N/A	N/A	N/A	2	N/A	4	4	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
85	SP	APP.	IN-CAR SPEECH	N/A	2	4	4	N/A	N/A	N/A	1	N/A	3	4	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A
86	SP	APP.	PROFICIENCY TESTING	N/A	2	2	4	N/A	N/A	N/A	1	N/A	3	1	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
87	SP	APP.	DESKTOP DICTATION	N/A	3	3	3	N/A	N/A	N/A	4	N/A	4	4	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A
88	SP	APP.	DESKTOP CMD/CTRL	N/A	3	3	3	N/A	N/A	N/A	3	N/A	4	4	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A
89	SP	APP.	BROADCAST NEWS	N/A	2	2	1	N/A	N/A	N/A	1	N/A	2	2	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
90	SP	APP.	TRANSCRIPTION TOOLS & SERVICES (MOSTLY MEDICAL)	N/A	3	3	2	N/A	N/A	N/A	3	N/A	4	2	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
91	SP	APP.	UNIFIED MESSAGING	N/A	3	3	3	N/A	N/A	N/A	2	N/A	3	4	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A
92	SP	APP.	EMBEDDED SR	N/A	3	4	3	N/A	N/A	N/A	2	N/A	4	3	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A
93	SP	APP.	SECURITY	N/A	2	3	2	N/A	N/A	N/A	2	N/A	3	1	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
94	SP	APP.	HOME AUTOMATION	N/A	2	2	2	N/A	N/A	N/A	1	N/A	3	2	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
95	SP	APP.	ASSISTIVE TECHNOLOGY	N/A	2	2	2	N/A	N/A	N/A	1	N/A	3	4	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A
96	SP	APP.	AUDIOVISUAL INDEX/SEARCH	N/A	3	4	1	N/A	N/A	N/A	1	N/A	2	3	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A

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97	SP	APP.	SPEECH-TO-SPEECH TRANSL.	N/A	2	2	2	N/A	N/A	N/A	1	N/A	2	1	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A
98	SP	APP.	DUBBING	N/A	2	3	1	N/A	N/A	N/A	2	N/A	2	2	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
99	SP	APP.	DIGITAL AUDIO POST-PROD.	N/A	2	3	1	N/A	N/A	N/A	2	N/A	2	2	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
100	SP	APP.	CLOSED CAPTIONING	N/A	2	2	1	N/A	N/A	N/A	1	N/A	2	3	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
101	SP	APP.	AUTOMATIC TRANSCRIPTION	N/A	2	2	1	N/A	N/A	N/A	1	N/A	2	3	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
102	TR	TECHNO L.	MACHINE TRANSLATION / SINGLE LANGUAGE	N/A	3	3	N/A	3	N/A	N/A	N/A	3	2.8	4	3	3	1	N/A	3	3	4	N/A	N/A	N/A	4
103	TR	TECHNO L.	MACHINE TRANSLATION / MULTIPLE LANGS.	N/A	3	3	N/A	2	N/A	N/A	N/A	4	2.8	4	3	3	1	N/A	3	3	4	N/A	N/A	N/A	4
104	TR	TECHNO L.	MACHINE TRANSLATION / ENGINES	N/A	2	2	N/A	2	N/A	N/A	N/A	3	3.5	4	3	4	2	N/A	4	3	4	N/A	N/A	N/A	2
105	TR	TECHNO L.	MACHINE TRANSLATION / CONTROLLED INPUT	N/A	3	3	N/A	2	N/A	N/A	N/A	3	2.8	3	4	4	2	N/A	3	3	4	N/A	N/A	N/A	2
106	TR	TECHNO L.	MACHINE TRANSLATION / NON-STRUCTURED INPUT	N/A	4	4	N/A	1	N/A	N/A	N/A	4	2.2	1	2	3	1	N/A	3	3	4	N/A	N/A	N/A	1
107	TR	TECHNO L.	MACHINE TRANSLATION / DATA MINING	N/A	3	3	N/A	2	N/A	N/A	N/A	4	3.5	1	2	4	3	N/A	3	3	3	N/A	N/A	N/A	2
108	TR	TECHNO L.	MACHINE TRANSLATION / BIDIRECTIONAL	N/A	3	3	N/A	2	N/A	N/A	N/A	4	2.8	3	3	4	2	N/A	3	3	4	N/A	N/A	N/A	3
109	TR	TECHNO L.	MACHINE TRANSLATION / ON-SITE INSTALL	N/A	3	3	N/A	3	N/A	N/A	N/A	3	3.5	4	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3
110	TR	TECHNO L.	MACHINE TRANSLATION / INTEGRATION	N/A	3	2	N/A	2	N/A	N/A	N/A	3	3.5	3	2	4	2	N/A	4	3	3	N/A	N/A	N/A	3
111	TR	TECHNO L.	MACHINE TRANSLATION / WEB-BASED	N/A	3	4	N/A	4	N/A	N/A	N/A	1	5	4	3	4	3	N/A	3	3	4	N/A	N/A	N/A	4
112	TR	TECHNO L.	MACHINE TRANSLATION / ERROR DETECTION	N/A	1	1	N/A	1	N/A	N/A	N/A	5	2.8	1	2	3	3	N/A	3	1	2	N/A	N/A	N/A	1
113	TR	TECHNO L.	TRANSLATION MEMORY / MULTIPLE LANGS.	N/A	N/A	N/A	N/A	4	N/A	N/A	N/A	1	5	4	4	4	3	N/A	2	3	4	N/A	N/A	N/A	4

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114	TR	TECHNO L.	TRANSLATION MEMORY / MULTILINGUAL INTERFACE	N/A	N/A	N/A	N/A	4	N/A	N/A	N/A	1	5	4	4	4	3	N/A	2	3	4	N/A	N/A	N/A	4
115	TR	TECHNO L.	TRANSLATION MEMORY / WEB-BASED	N/A	4	4	N/A	4	N/A	N/A	N/A	5	5	1	3	4	2	N/A	3	3	4	N/A	N/A	N/A	1
116	TR	TECHNO L.	TRANSLATION MEMORY / ON-SITE INSTALL	N/A	3	3	N/A	3	N/A	N/A	N/A	3	3.5	3	3	4	2	N/A	3	3	4	N/A	N/A	N/A	4
117	TR	TECHNO L.	TRANSLATION MEMORY / INTEGRATION	N/A	3	3	N/A	3	N/A	N/A	N/A	4	3.5	4	4	4	2	N/A	3	3	4	N/A	N/A	N/A	4
118	TR	TECHNO L.	TRANSLATION MEMORY / SENTENCE ALIGNMENT	N/A	3	3	N/A	3	N/A	N/A	N/A	4	2.8	2	3	3	1	N/A	3	3	4	N/A	N/A	N/A	2
119	TR	TECHNO L.	TRANSLATION MEMORY / LEVERAGE FILE	N/A	2	3	N/A	3	N/A	N/A	N/A	1	3.5	4	4	4	3	N/A	3	3	4	N/A	N/A	N/A	4
120	TR	TECHNO L.	TRANSLATION MEMORY / LEVERAGE COMPANY	N/A	3	4	N/A	2	N/A	N/A	N/A	4	2.8	2	2	4	2	N/A	3	3	4	N/A	N/A	N/A	2
121	TR	TECHNO L.	TRANSLATION MEMORY / LEVERAGE INDUSTRY	N/A	4	4	N/A	1	N/A	N/A	N/A	5	2.2	1	1	4	2	N/A	3	3	4	N/A	N/A	N/A	1
122	TR	TECHNO L.	TERMINOLOGY / LANGUAGE PAIRS	N/A	N/A	N/A	N/A	3	N/A	N/A	N/A	1	5	4	4	4	4	N/A	2	2	3	N/A	N/A	N/A	4
123	TR	TECHNO L.	TERMINOLOGY / MULTILINGUAL INTERFACE	N/A	N/A	N/A	N/A	4	N/A	N/A	N/A	1	5	4	4	4	3	N/A	2	2	3	N/A	N/A	N/A	4
124	TR	TECHNO L.	TERMINOLOGY / WEB-BASED	N/A	3	3	N/A	4	N/A	N/A	N/A	1	5	3	4	4	2	N/A	2	2	4	N/A	N/A	N/A	4
125	TR	TECHNO L.	TERMINOLOGY / ON-SITE INSTALL	N/A	3	3	N/A	3	N/A	N/A	N/A	3	2.8	2	3	4	2	N/A	2	2	3	N/A	N/A	N/A	3
126	TR	TECHNO L.	TERMINOLOGY / TERM EXTRACTION	N/A	3	4	N/A	2	N/A	N/A	N/A	4	3.5	1	2	3	1	N/A	3	3	4	N/A	N/A	N/A	2
127	TR	TECHNO L.	TERMINOLOGY / INDUSTRY SPECIFIC	N/A	3	3	N/A	2	N/A	N/A	N/A	4	2.8	2	2	3	1	N/A	2	2	3	N/A	N/A	N/A	4
128	TR	TECHNO L.	WORKFLOW / TRANSLATION SPECIFIC	N/A	3	3	N/A	1	N/A	N/A	N/A	5	2.8	1	3	4	2	N/A	2	2	3	N/A	N/A	N/A	3
129	TR	TECHNO L.	WORKFLOW / ADAPTED	N/A	3	3	N/A	2	N/A	N/A	N/A	4	2.8	1	3	4	2	N/A	2	2	4	N/A	N/A	N/A	4

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	TIME TO MARKET	NATIONAL MARKET	INTERNATIONAL MARKET	EASE OF USE	EASE OF INTEGRATION	MODEL DEVELOPMENT	GRAMMAR DEVELOPMENT	DEVELOPMENT COST	ENHANCEMENTS	END-USER RETURN ON INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	CROSS-OVER	APPLICABILITY TO LANGUAGE TRAINING	APPLICABILITY TO TRANSLATION	APPLICABILITY TO SPEECH PROCESSING	APPLICABILITY TO CONTENT MANAGEMENT	APPLICATIONS & TOOLS	EXISTING STRENGTHS	LANGUAGE TRAINING SPECIFICITY	REVENUE MODEL	MATURITY	
130	TR	TECHNO L.	WORKFLOW / COMPANY SPECIFIC	N/A	3	3	N/A	2	N/A	N/A	N/A	4	2.8	1	3	3	1	N/A	2	2	2	N/A	N/A	N/A	4	
131	TR	TECHNO L.	WORKFLOW / ON-SITE INSTALL	N/A	3	3	N/A	2	N/A	N/A	N/A	4	2.8	2	3	4	2	N/A	2	2	4	N/A	N/A	N/A	4	
132	TR	TECHNO L.	WORKFLOW / WEB-BASED	N/A	4	4	N/A	4	N/A	N/A	N/A	4	2.2	1	4	4	3	N/A	2	2	4	N/A	N/A	N/A	2	
133	TR	TECHNO L.	RESOURCING / MLV	N/A	3	3	N/A	N/A	N/A	N/A	N/A	1	5	2	N/A	1	N/A	N/A	N/A	N/A	3	N/A	N/A	N/A	3	
134	TR	TECHNO L.	RESOURCING / SLV	N/A	3	3	N/A	N/A	N/A	N/A	N/A	1	5	2	N/A	1	N/A	N/A	N/A	N/A	3	N/A	N/A	N/A	3	
135	TR	TECHNO L.	RESOURCING / TRANSLATOR DIRECT WEB	N/A	3	3	N/A	N/A	N/A	N/A	N/A	1	5	2	N/A	1	N/A	N/A	N/A	N/A	3	N/A	N/A	N/A	3	
136	TR	APP.	MACHINE TRANSLATION / INSTALLED CLIENT	N/A	3	3	1	N/A	N/A	N/A	1	N/A	1	2.4	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A
137	TR	APP.	MACHINE TRANSLATION / WEB-BASED	N/A	3	3	4	N/A	N/A	N/A	1	N/A	4	3.5	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
138	TR	APP.	MACHINE TRANSLATION / ENGINES	N/A	4	2	1	N/A	N/A	N/A	1	N/A	2	2.6	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A
139	TR	APP.	MACHINE TRANSLATION / DATA MINING	N/A	4	2	2	N/A	N/A	N/A	2	N/A	3	3	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
140	TR	APP.	MACHINE TRANSLATION / GISTING	N/A	4	3	2	N/A	N/A	N/A	1	N/A	3	3	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
141	TR	APP.	TRANSLATION MEMORY / INSTALLED CLIENT	N/A	3	3	1	N/A	N/A	N/A	2	N/A	3	3	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A
142	TR	APP.	TRANSLATION MEMORY / WEB-BASED	N/A	4	4	2	N/A	N/A	N/A	1	N/A	4	3.5	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
143	TR	APP.	TRANSLATION MEMORY / SEARCH	N/A	3	3	2	N/A	N/A	N/A	4	N/A	3	3	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
144	TR	APP.	TRANSLATION MEMORY / ALIGNMENT	N/A	3	3	1	N/A	N/A	N/A	1	N/A	1	2.4	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
145	TR	APP.	TRANSLATION MEMORY / LEVERAGING	N/A	3	3	1	N/A	N/A	N/A	2	N/A	4	3.5	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
146	TR	APP.	TRANSLATION MEMORY / FILE CONVERSION	N/A	2	2	2	N/A	N/A	N/A	4	N/A	4	3.5	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	TIME TO MARKET	NATIONAL MARKET	INTERNATIONAL MARKET	EASE OF USE	EASE OF INTEGRATION	MODEL DEVELOPMENT	GRAMMAR DEVELOPMENT	DEVELOPMENT COST	ENHANCEMENTS	END-USER RETURN ON INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	CROSS-OVER	APPLICABILITY TO LANGUAGE TRAINING	APPLICABILITY TO TRANSLATION	APPLICABILITY TO SPEECH PROCESSING	APPLICABILITY TO CONTENT MANAGEMENT	APPLICATIONS & TOOLS	EXISTING STRENGTHS	LANGUAGE TRAINING SPECIFICITY	REVENUE MODEL	MATURITY
147	TR	APP.	TRANSLATION MEMORY / LEVERAGE BY FILE	N/A	2	2	2	N/A	N/A	N/A	3	N/A	4	3.5	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
148	TR	APP.	TRANSLATION MEMORY / LEVERAGE BY COMPANY	N/A	3	3	1	N/A	N/A	N/A	2	N/A	3	3	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
149	TR	APP.	TRANSLATION MEMORY / LEVERAGE BY INDUSTRY	N/A	4	4	1	N/A	N/A	N/A	1	N/A	2	2.6	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
150	TR	APP.	WORKFLOW SYSTEMS / INSTALLED	N/A	3	2	1	N/A	N/A	N/A	2	N/A	1	2.4	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A
151	TR	APP.	WORKFLOW SYSTEMS / WEB-BASED	N/A	4	4	2	N/A	N/A	N/A	1	N/A	4	3.5	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,5	N/A
152	TR	APP.	WORKFLOW SYSTEMS / ADAPTED FOR TRANSLATION	N/A	3	3	1	N/A	N/A	N/A	2	N/A	2	2.6	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A

TABLE 2. EVALUATION OF LANGUAGE TECHNOLOGY TARGETED SOFTWARE.

1.1.2.2. SELECTED EVALUATION RESULTS

1.1.2.2.1. Market opportunities

THIS SECTION DISCUSSES THE EVALUATION RESULTS FROM THE PERSPECTIVE OF MARKET OPPORTUNITIES. TABLE 3 BELOW LISTS THE TOP-RANKING SOFTWARE IN TERMS OF NATIONAL MARKET OPPORTUNITIES. THE RESULTS ARE DISAGGREGATED BY TYPE OF SOFTWARE: APPLICATIONS, RESOURCES, TECHNOLOGY / TOOLS. FOR EACH OF THE THREE SUB-LISTS, ONLY THE ITEMS IN THE TOP PARTITION CLASS ARE LISTED. FOR THE READER'S CONVENIENCE, WE REPEAT HERE THE PARTITION IN USE.

CATEGORY	INTERPRETATION	1	2	3	4
NATIONAL MARKET	OPPORTUNITY ANNUAL VALUE IN EXCESS OF X	\$100,000	\$1 M.	\$10 M.	\$100 M.
INTERNATIONAL MARKET	OPPORTUNITY ANNUAL VALUE IN EXCESS OF X	\$1 M.	\$10 M.	\$100 M.	\$1,000 M.

WITH RESPECT TO RESOURCES, SINCE THE TOP PARTITION CLASS (4) IS EMPTY, THE ITEMS INCLUDED IN THE NEXT HIGHEST PARTITION CLASS (3) ARE LISTED INSTEAD.

<i>PROGR. ID</i>	<i>SUBSECTOR</i>	<i>TYPE OF SOFTWARE</i>	<i>SOFTWARE</i>	<i>NATIONAL MARKET</i>
<i>APPLICATIONS</i>				
2	CM	APP.	DIALOGUE	4
3	CM	APP.	INTELLIGENT SPEECH-TO-TEXT	4
4	CM	APP.	MULTILING. QA	4
5	CM	APP.	UNSTRUC. IR	4
6	CM	APP.	TEXT ANALYTICS	4
7	CM	APP.	TEXT GENERATOR	4
60	LT	APP./PL.	COURSEWARE AUTHORIZING TOOLS/LEARNING MANAGEMENT SYSTEMS	4
138	TR	APP.	MACHINE TRANSLATION / ENGINES	4
139	TR	APP.	MACHINE TRANSLATION / DATA MINING	4
140	TR	APP.	MACHINE TRANSLATION / GISTING	4
142	TR	APP.	TRANSLATION MEMORY / WEB-BASED	4
149	TR	APP.	TRANSLATION MEMORY / LEVERAGE BY INDUSTRY	4
151	TR	APP.	WORKFLOW SYSTEMS / WEB-BASED	4
<i>RESOURCES</i>				
15	LT	RES.	SUBSCRIPTION WEB SITE PROVIDING ONLINE LEARNING MATERIALS FOR TEACHERS, AND MATCHING A NATIONAL CURRICULUM	3
16	LT	RES.	MAJOR MEDIA OUTLETS WITH EDUCATION NEWS AND RESOURCES	3
18	LT	RES.	INTERNET DIRECTORIES OF STUDY-ABROAD OPPORTUNITIES FOR DOMESTIC AND INTERNATIONAL STUDENTS	3
21	LT	RES.	STANDARDS-BASED TEACHER RESOURCE TO HELP TEACHERS WITH TECHNOLOGY USE	3
22	LT	RES.	MULTILINGUAL DICTIONARY SOFTWARE ON CELL PHONE OR PDA FOR TRANSLATION AND LANGUAGE TRAINING	3
<i>TECHNOLOGY/ TOOLS</i>				
78	SP	TECHNO L.	SIGNAL PROCESSING / SPEECH COMPRESSION	4
106	TR	TECHNO L.	MACHINE TRANSLATION / NON-STRUCTURED INPUT	4
115	TR	TECHNO L.	TRANSLATION MEMORY / WEB-BASED	4
121	TR	TECHNO L.	TRANSLATION MEMORY / LEVERAGE INDUSTRY	4
132	TR	TECHNO L.	WORKFLOW / WEB-BASED	4

TABLE 3. TOP-RANKING SOFTWARE BY NATIONAL MARKET OPPORTUNITIES

THE FOLLOWING TABLE PROVIDES EVALUATION RESULTS IN TERMS OF INTERNATIONAL MARKET OPPORTUNITIES, IN ANALOGOUS FORM TO THOSE SHOWN ABOVE FOR THE NATIONAL MARKET.

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	INTERNATIONAL MARKET
APPLICATIONS				
2	CM	APP.	DIALOGUE	4
3	CM	APP.	INTELLIGENT SPEECH-TO-TEXT	4
4	CM	APP.	MULTILING. QA	4
5	CM	APP.	UNSTRUC. IR	4
6	CM	APP.	TEXT ANALYTICS	4
7	CM	APP.	TEXT GENERATOR	4
54	LT	APP./PL.	SPEECH ANALYSIS AND FEEDBACK SOFTWARE ON MOBILE DEVICES	4
60	LT	APP./PL.	COURSEWARE AUTHORIZING TOOLS/LEARNING MANAGEMENT SYSTEMS	4
82	SP	APP.	INTERACTIVE VOICE RESPONSE	4
85	SP	APP.	IN-CAR SPEECH	4
92	SP	APP.	EMBEDDED SR	4
96	SP	APP.	AUDIOVISUAL INDEX/SEARCH	4
142	TR	APP.	TRANSLATION MEMORY / WEB-BASED	4
149	TR	APP.	TRANSLATION MEMORY / LEVERAGE BY INDUSTRY	4
151	TR	APP.	WORKFLOW SYSTEMS / WEB-BASED	4
RESOURCES				
22	LT	RES.	MULTILINGUAL DICTIONARY SOFTWARE ON CELL PHONE OR PDA FOR TRANSLATION AND LANGUAGE TRAINING	4
TECHNOLOGY / TOOLS				
29	LT	TOOL	FULL SUBSCRIPTION-BASED ONLINE ENGLISH COURSES	4
33	LT	TOOL	LANGUAGE LEARNING SYSTEMS WITH MULTIMEDIA TOOLS (VIDEO, RECORDING, INTERACTIVE TESTS)	4
36	LT	TOOL	LANGUAGE LEARNING TOOLS DELIVERED ON MOBILE DEVICES	4
38	LT	TOOL	TELEVISION/RADIO DELIVERY OF LANGUAGE TRAINING CONTENT BACKED BY STUDY MATERIALS	4
41	LT	TOOL	ONLINE PRACTICE TOOLS FOR STANDARDIZED ASSESSMENT	4
78	SP	TECHNO L.	SIGNAL PROCESSING / SPEECH COMPRESSION	4
106	TR	TECHNO L.	MACHINE TRANSLATION / NON-STRUCTURED INPUT	4
111	TR	TECHNO L.	MACHINE TRANSLATION / WEB-BASED	4
115	TR	TECHNO L.	TRANSLATION MEMORY / WEB-BASED	4
120	TR	TECHNO L.	TRANSLATION MEMORY / LEVERAGE COMPANY	4
121	TR	TECHNO L.	TRANSLATION MEMORY / LEVERAGE INDUSTRY	4
126	TR	TECHNO L.	TERMINOLOGY / TERM EXTRACTION	4
132	TR	TECHNO L.	WORKFLOW / WEB-BASED	4

TABLE 4. TOP-RANKING SOFTWARE BY INTERNATIONAL MARKET OPPORTUNITIES

FINALLY, THE FOLLOWING TABLE PROVIDES LISTS OF TOP-SCORING SOFTWARE IN TERMS OF COMBINED NATIONAL AND INTERNATIONAL MARKET OPPORTUNITIES. IN THIS CASE EACH SUB-LIST INCLUDES ALL ITEMS FALLING IN THE TWO TOP, NON-EMPTY PARTITION CLASSES.

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	NATIONAL MARKET	INTERNATIONAL MARKET	COMBINED SCORE
APPLICATIONS						
2	CM	APP.	DIALOGUE	4	4	8
3	CM	APP.	INTELLIGENT SPEECH-TO-TEXT	4	4	8
4	CM	APP.	MULTILING. QA	4	4	8
5	CM	APP.	UNSTRUC. IR	4	4	8
6	CM	APP.	TEXT ANALYTICS	4	4	8
7	CM	APP.	TEXT GENERATOR	4	4	8
60	LT	APP./PL.	COURSEWARE AUTHORIZING TOOLS/LEARNING MANAGEMENT SYSTEMS	4	4	8
142	TR	APP.	TRANSLATION MEMORY / WEB-BASED	4	4	8
149	TR	APP.	TRANSLATION MEMORY / LEVERAGE BY INDUSTRY	4	4	8
151	TR	APP.	WORKFLOW SYSTEMS / WEB-BASED	4	4	8
54	LT	APP./PL.	SPEECH ANALYSIS AND FEEDBACK SOFTWARE ON MOBILE DEVICES	3	4	7
82	SP	APP.	INTERACTIVE VOICE RESPONSE	3	4	7
92	SP	APP.	EMBEDDED SR	3	4	7
96	SP	APP.	AUDIOVISUAL INDEX/SEARCH	3	4	7
140	TR	APP.	MACHINE TRANSLATION / GISTING	4	3	7
RESOURCES						
22	LT	RES.	MULTILINGUAL DICTIONARY SOFTWARE ON CELL PHONE OR PDA FOR TRANSLATION AND LANGUAGE TRAINING	3	4	7
15	LT	RES.	SUBSCRIPTION WEB SITE PROVIDING ONLINE LEARNING MATERIALS FOR TEACHERS, AND MATCHING A NATIONAL CURRICULUM	3	3	6
16	LT	RES.	MAJOR MEDIA OUTLETS WITH EDUCATION NEWS AND RESOURCES	3	3	6
18	LT	RES.	INTERNET DIRECTORIES OF STUDY-ABROAD OPPORTUNITIES FOR DOMESTIC AND INTERNATIONAL STUDENTS	3	3	6
21	LT	RES.	STANDARDS-BASED TEACHER RESOURCE TO HELP TEACHERS WITH TECHNOLOGY USE	3	3	6
TECHNOLOGY / TOOLS						
78	SP	TECHNO L.	SIGNAL PROCESSING / SPEECH COMPRESSION	4	4	8
106	TR	TECHNO L.	MACHINE TRANSLATION / NON-STRUCTURED INPUT	4	4	8
115	TR	TECHNO L.	TRANSLATION MEMORY / WEB-BASED	4	4	8
121	TR	TECHNO L.	TRANSLATION MEMORY / LEVERAGE INDUSTRY	4	4	8
132	TR	TECHNO L.	WORKFLOW / WEB-BASED	4	4	8
29	LT	TOOL	FULL SUBSCRIPTION-BASED ONLINE ENGLISH COURSES	3	4	7
33	LT	TOOL	LANGUAGE LEARNING SYSTEMS WITH MULTIMEDIA TOOLS (VIDEO, RECORDING, INTERACTIVE TESTS)	3	4	7
36	LT	TOOL	LANGUAGE LEARNING TOOLS DELIVERED ON MOBILE DEVICES	3	4	7
38	LT	TOOL	TELEVISION/RADIO DELIVERY OF LANGUAGE TRAINING CONTENT BACKED BY STUDY MATERIALS	3	4	7
41	LT	TOOL	ONLINE PRACTICE TOOLS FOR STANDARDIZED ASSESSMENT	3	4	7
111	TR	TECHNO L.	MACHINE TRANSLATION / WEB-BASED	3	4	7
120	TR	TECHNO L.	TRANSLATION MEMORY / LEVERAGE COMPANY	3	4	7
126	TR	TECHNO L.	TERMINOLOGY / TERM EXTRACTION	3	4	7

TABLE 5. TOP-RANKING SOFTWARE BY COMBINED MARKET OPPORTUNITIES

IT IS ALSO OF INTEREST TO ANALYSE THE GENERAL PATTERN OF THE RELATION BETWEEN NATIONAL AND INTERNATIONAL MARKET OPPORTUNITIES. THE FOLLOWING TABLE SHOWS RESULTS OBTAINED BY SYSTEMATICALLY COMPARING NATIONAL AND INTERNATIONAL MARKET OPPORTUNITIES FOR EACH TARGETED SOFTWARE, AND RECORDING: (I) HOW OFTEN THE RESPECTIVE OPPORTUNITIES ARE COMPARABLE; (II) HOW OFTEN THE NATIONAL MARKET OPPORTUNITIES ARE LOWER THAN THE INTERNATIONAL MARKET ONES; AND (III) HOW OFTEN THE REVERSE OCCURS. NOTE THAT THE COMPARISON IS DONE BY PARTITION CLASS RATHER THAN BY ABSOLUTE DOLLAR VALUES, AS THE FORMER CRITERION WAS DEEMED TO BE MORE SIGNIFICANT. HENCE, AN ITEM WITH NATIONAL AND INTERNATIONAL MARKET VALUES OF \$100 M. AND \$1,000 M., RESPECTIVELY, IS DEEMED TO OFFER COMPARABLE OPPORTUNITIES, AS IN BOTH CASES THE PARTITION CLASS IS 4, WHEREAS AN ITEM WITH BOTH NATIONAL AND INTERNATIONAL MARKET VALUES OF \$100 M. IS DEEMED TO OFFER LESS NATIONAL OPPORTUNITIES THAN INTERNATIONAL ONES, AS THE RESPECTIVE PARTITION CLASSES ARE 3 AND 4.

Sub-sector	Type of software	National market is in...						
		... LOWER PARTITION CLASS THAN INTL. MARKET		... SAME PARTITION CLASS AS INTL. MARKET		... HIGHER PARTITION CLASS THAN INTL. MARKET		
		#	%	#	%	#	%	TOTAL #
CM	APP.	0	0.0	7	100.0	0	0.0	7
CM	RES.	0	0.0	4	100.0	0	0.0	4
CM	TOOL	0	0.0	2	100.0	0	0.0	2
LT	APP./PL.	3	23.1	10	76.9	0	0.0	13
LT	RES.	4	30.8	9	69.2	0	0.0	13
LT	TOOL	10	43.5	12	52.2	1	4.3	23
SP	APP.	7	33.3	14	66.7	0	0.0	21
SP	TECHNOL.	0	0.0	16	88.9	2	11.1	18
TR	APP.	0	0.0	13	76.5	4	23.5	17
TR	TECHNOL.	4	13.3	25	83.3	1	3.3	30
<i>TOTAL</i>		28	18.9	112	75.7	8	5.4	148

TABLE 6. RELATION BETWEEN NATIONAL AND INTERNATIONAL MARKET OPPORTUNITIES

TABLE 6 CONFIRMS WHAT TABLE 5 ALREADY INTUITIVELY SUGGESTED, I.E. THAT THERE SEEMS TO BE A STRONG RELATION BETWEEN NATIONAL AND INTERNATIONAL MARKET OPPORTUNITIES. IN ABOUT 75% OF CASES THE PARTITION CLASS IS THE SAME FOR NATIONAL AND INTERNATIONAL MARKET OPPORTUNITIES, AND IN ABOUT 95% OF THE CASES INTERNATIONAL MARKET OPPORTUNITIES ARE IN THE SAME OR IN A HIGHER PARTITION CLASS. IN OTHER WORDS, BY FOCUSING ON THE MOST PROMISING NATIONAL MARKET OPPORTUNITIES, THERE IS A VERY HIGH PROBABILITY THAT THE SAME SOFTWARE HAVE EQUALLY OR EVEN MORE PROMISING OPPORTUNITIES ON THE INTERNATIONAL MARKET. THIS, IN TURN, CORROBORATES ONE OF THE FUNDAMENTAL CLAIMS OF THE ACTION PLAN FOR OFFICIAL LANGUAGES, I.E. THAT BY SUCCESSFULLY TAKING UP THE CHALLENGE POSED BY THE CANADIAN MARKET AND BY THE VISION

EXPRESSED IN THE ACTION PLAN, THE CANADIAN LANGUAGE TECHNOLOGY SECTOR IS LIKELY TO PLACE ITSELF AT THE FOREFRONT OF THE COMPETITION TO SUCCEED ON THE INTERNATIONAL MARKET.

1.1.2.2.2. Development cost

THE FOLLOWING IS THE EVALUATION SCALE IN USE FOR DEVELOPMENT COST:

Attribute	Interpretation	Evaluation scale					
		<i>0</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>DEVELOPMENT COST</i>		N/A	\$10 M.	\$1 M.	\$100,000	\$10,000	N/A

SINCE NO DEVELOPMENT COST INFORMATION IS AVAILABLE FOR THE *TECHNOLOGY* CATEGORY, RANKING BY DEVELOPMENT COST IS ONLY PROVIDED FOR APPLICATIONS, RESOURCES AND TOOLS. GIVEN THE LIMITED SIZE OF THE TOP PARTITION CLASS FOR EACH CATEGORY, THE RANKING INCLUDES THE TWO TOP PARTITION CLASSES.

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	DEVELOPMENT COST
<i>APPLICATIONS</i>				
87	SP	APP.	DESKTOP DICTATION	4
143	TR	APP.	TRANSLATION MEMORY / SEARCH	4
146	TR	APP.	TRANSLATION MEMORY / FILE CONVERSION	4
59	LT	APP./PL.	ONLINE TESL COURSES	3
56	LT	APP./PL.	SUBSCRIPTION-BASED ONLINE LANGUAGE LEARNING APPLICATIONS FOR MOBILE DEVICES	3
57	LT	APP./PL.	TEXT TO SPEECH APPLICATIONS	3
58	LT	APP./PL.	ASSESSMENT AUTHORIZING APPLICATIONS	3
82	SP	APP.	INTERACTIVE VOICE RESPONSE	3
88	SP	APP.	DESKTOP CMD/CTRL	3
90	SP	APP.	TRANSCRIPTION TOOLS & SERVICES (MOSTLY MEDICAL)	3
147	TR	APP.	TRANSLATION MEMORY / LEVERAGE BY FILE	3
<i>RESOURCES</i>				
25	LT	RES.	INTERACTIVE DICTIONARIES	4
10	CM	RES.	PARALLEL CORPORA	3
11	CM	RES.	WRITTEN CORPORA	3
16	LT	RES.	MAJOR MEDIA OUTLETS WITH EDUCATION NEWS AND RESOURCES	3
18	LT	RES.	INTERNET DIRECTORIES OF STUDY-ABROAD OPPORTUNITIES FOR DOMESTIC AND INTERNATIONAL STUDENTS	3
17	LT	RES.	GLOBAL INTERNET NETWORKS PARTNERING LANGUAGE LEARNERS WITH EACH OTHER	3
23	LT	RES.	SUBSCRIPTION-BASED RESOURCE SITES SPECIFICALLY FOR ESL TEACHERS	3
19	LT	RES.	ONLINE LITERATURE LIBRARIES WITH INDIVIDUAL VOCABULARY LINKS AND/OR SPEECH MODELING	3
20	LT	RES.	ONLINE REPOSITORIES OF INFORMATION ON THE LANGUAGE TRAINING INDUSTRY, WITH CONSULTING	3
24	LT	RES.	ONLINE DICTIONARIES	3
26	LT	RES.	COMPANION WEBSITE TO TEXTBOOKS/TEXT ENRICHMENT SITES/ONLINE COURSE SUPPORT	3
14	LT	RES.	WEB SITE WITH LESSON PLAN RESOURCES FOR TEACHERS AND/OR ACTIVITY RESOURCES FOR STUDENTS	3
<i>Tools</i>				
46	LT	TOOL	FREWARE / SHAREWARE TOOLS AVAILABLE FOR COST-EFFECTIVE LICENSE	4
13	CM	TOOL	TERMINOLOGY ACQ./MAINT.	3
42	LT	TOOL	ISSUE-BASED INTERACTIVE SOFTWARE	3
45	LT	TOOL	SPECIAL-PURPOSE ONLINE LANGUAGE TRAINING	3
47	LT	TOOL	BUSINESS COMMUNICATION SOFTWARE	3
37	LT	TOOL	ONLINE LANGUAGE TRAINING TOOL SUPPORTED BY PEER-TO-PEER LEARNER AND TRAINER INTERACTION	3
35	LT	TOOL	ONLINE VOCABULARY ASSESSMENT AND DEVELOPMENT TOOLS	3
49	LT	TOOL	TECHNOLOGY-ENABLED ASSESSMENT FOR EMPLOYMENT CERTIFICATION	3

TABLE 7. TOP-RANKING SOFTWARE BY DEVELOPMENT COST

1.1.2.2.3. End-user return-on-investment

THE EVALUATION SCALE IN USE FOR END-USER ROI IS THE FOLLOWING:

Attribute	Interpretation	Evaluation scale					
		0	1	2	3	4	5
<i>END-USER RETURN ON INVESTMENT</i>	COST RECOVERED IN X	N/A	TEN YEARS	FIVE YEARS [MOREOVER: 2.2 = 3+ YEARS; 2.4 = >2 YEARS; 2.6 = 2 YEARS; 2.8 = 1-2 YEARS]	ONE YEAR; [MOREOVER: 3.5 = SIX MONTHS]	TWO MONTHS	ONE MONTH

TABLE 8 LISTS THE TOP-RANKING SOFTWARE BY END-USER RETURN-ON-INVESTMENT. SINCE THE EVALUATION SCALE IS THE RESULT OF MERGING AND NORMALIZING THREE ORIGINAL SCALES, IT WAS DECIDED TO INCLUDE THE TWO TOP PARTITION CLASSES—REGARDLESS OF WHETHER THEY ARE EMPTY OR NON-EMPTY—FOR EACH TYPE OF SOFTWARE. IN THIS WAY IT IS ENSURED THAT THE TOP CLASS OF EACH ORIGINAL SCALE IS REPRESENTED IN THE FINAL TABLE. CONSIDER, FOR EXAMPLE, THE TECHNOLOGY / TOOLS RANKING. BY INCLUDING ONLY THE TOP PARTITION CLASS (5), WHICH IS THE MAPPING OF AN ORIGINAL PARTITION CLASS ONLY USED IN THE TRANSLATION SECTOR (CORRESPONDING TO THE VALUE “ONE MONTH”), THE TOP-RANKING ITEM FROM OTHER SECTORS, TO WHICH THAT SCORE COULD NOT POSSIBLY BE ASSIGNED, WOULD HAVE HAD NO CHANCE TO ENTER THE FINAL LIST.

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	END-USER ROI
APPLICATIONS				
59	LT	APP./PL.	ONLINE TESL COURSES	4
81	SP	APP.	CALL CENTRES, WEB PORTALS	4
82	SP	APP.	INTERACTIVE VOICE RESPONSE	4
84	SP	APP.	OUTBOUND DIALING	4
87	SP	APP.	DESKTOP DICTATION	4
88	SP	APP.	DESKTOP CMD/CTRL	4
90	SP	APP.	TRANSCRIPTION TOOLS & SERVICES (MOSTLY MEDICAL)	4
92	SP	APP.	EMBEDDED SR	4
137	TR	APP.	MACHINE TRANSLATION / WEB-BASED	3.5
142	TR	APP.	TRANSLATION MEMORY / WEB-BASED	3.5
145	TR	APP.	TRANSLATION MEMORY / LEVERAGING	3.5
146	TR	APP.	TRANSLATION MEMORY / FILE CONVERSION	3.5
147	TR	APP.	TRANSLATION MEMORY / LEVERAGE BY FILE	3.5
151	TR	APP.	WORKFLOW SYSTEMS / WEB-BASED	3.5
RESOURCES				
14	LT	RES.	WEB SITE WITH LESSON PLAN RESOURCES FOR TEACHERS AND/OR ACTIVITY RESOURCES FOR STUDENTS	3
TECHNOLOGY / TOOLS				
111	TR	TECHNO L.	MACHINE TRANSLATION / WEB-BASED	5
113	TR	TECHNO L.	TRANSLATION MEMORY / MULTIPLE LANGS.	5
114	TR	TECHNO L.	TRANSLATION MEMORY / MULTILINGUAL INTERFACE	5
115	TR	TECHNO L.	TRANSLATION MEMORY / WEB-BASED	5
122	TR	TECHNO L.	TERMINOLOGY / LANGUAGE PAIRS	5
123	TR	TECHNO L.	TERMINOLOGY / MULTILINGUAL INTERFACE	5
124	TR	TECHNO L.	TERMINOLOGY / WEB-BASED	5
133	TR	TECHNO L.	RESOURCING / MLV	5
134	TR	TECHNO L.	RESOURCING / SLV	5
135	TR	TECHNO L.	RESOURCING / TRANSLATOR DIRECT WEB	5
64	SP	TECHNO L.	SPEECH RECOGNITION / SPEAKER DEP.	4
72	SP	TECHNO L.	SPEECH-TO-TEXT / SYNTHESIS	4
73	SP	TECHNO L.	SPEECH-TO-TEXT / CONCAT.	4
78	SP	TECHNO L.	SIGNAL PROCESSING / SPEECH COMPRESSION	4

TABLE 8. TOP-RANKING SOFTWARE BY END-USER RETURN-ON-INVESTMENT

1.1.2.2.4. Standards compliance

THE EVALUATION SCALE IN USE FOR STANDARDS COMPLIANCE IS THE FOLLOWING:

Attribute	Interpretation	Evaluation scale					
		0	1	2	3	4	5
STANDARDS COMPLIANCE		N/A	NO EXISTING STANDARD	CONSISTENT WITH SOME CURRENT STANDARD	CONSISTENT WITH DE FACTO STANDARD	COMPATIBLE WITH EXISTING INDUSTRY	N/A

THE FOLLOWING TABLE ILLUSTRATES THE TOP-RANKING SOFTWARE BY STANDARDS COMPLIANCE:

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	STANDARDS COMPLIANCE
APPLICATIONS				
51	LT	APP./PL.	HOSTING AND SUPPORT OF E-LEARNING PROGRAMS	4
53	LT	APP./PL.	ONLINE PROFESSIONAL DEVELOPMENT RESOURCES FOR TEACHERS AND ADMINISTRATORS	4
55	LT	APP./PL.	ONLINE ASSESSMENT SYSTEMS FOLLOWING NATIONAL STANDARDS	4
60	LT	APP./PL.	COURSEWARE AUTHORING TOOLS/LEARNING MANAGEMENT SYSTEMS	4
61	LT	APP./PL.	SKILL-SPECIFIC APPLICATIONS DEVELOPED ACCORDING TO NATIONAL STANDARDS	4
62	LT	APP./PL.	ASSESSMENT AND PROGRESS MANAGEMENT SYSTEMS DEVELOPED ACCORDING TO NATIONAL STANDARDS	4
81	SP	APP.	CALL CENTRES, WEB PORTALS	4
82	SP	APP.	INTERACTIVE VOICE RESPONSE	4
83	SP	APP.	DIRECTORY ASSISTANCE	4
84	SP	APP.	OUTBOUND DIALING	4
85	SP	APP.	IN-CAR SPEECH	4
87	SP	APP.	DESKTOP DICTATION	4
88	SP	APP.	DESKTOP CMD/CTRL	4
91	SP	APP.	UNIFIED MESSAGING	4
95	SP	APP.	ASSISTIVE TECHNOLOGY	4
141	TR	APP.	TRANSLATION MEMORY / INSTALLED CLIENT	4
146	TR	APP.	TRANSLATION MEMORY / FILE CONVERSION	4
147	TR	APP.	TRANSLATION MEMORY / LEVERAGE BY FILE	4
RESOURCES				
15	LT	RES.	SUBSCRIPTION WEB SITE PROVIDING ONLINE LEARNING MATERIALS FOR TEACHERS, AND MATCHING A NATIONAL CURRICULUM	4
21	LT	RES.	STANDARDS-BASED TEACHER RESOURCE TO HELP TEACHERS WITH TECHNOLOGY USE	4
TECHNOLOGY/ TOOLS				
28	LT	TOOL	STORYBOARD ROLE-PLAY SOFTWARE FOR CHILDREN	4
31	LT	TOOL	GAME-BASED SOFTWARE ON CD FOR LANGUAGE LEARNING	4
34	LT	TOOL	IMMERSIVE ENVIRONMENTS FOR SPECIFIC TASK-RELATED LANGUAGE LEARNING	4
35	LT	TOOL	ONLINE VOCABULARY ASSESSMENT AND DEVELOPMENT TOOLS	4
37	LT	TOOL	ONLINE LANGUAGE TRAINING TOOL SUPPORTED BY PEER-TO-PEER LEARNER AND TRAINER INTERACTION	4
40	LT	TOOL	ACCREDITED HOME STUDY PROGRAMS	4
41	LT	TOOL	ONLINE PRACTICE TOOLS FOR STANDARDIZED ASSESSMENT	4
49	LT	TOOL	TECHNOLOGY-ENABLED ASSESSMENT FOR EMPLOYMENT CERTIFICATION	4
63	SP	TECHNO L.	SPEECH RECOGNITION / EMBEDDED	4
64	SP	TECHNO L.	SPEECH RECOGNITION / SPEAKER DEP.	4

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	STANDARDS COMPLIANCE
65	SP	TECHNO L.	SPEECH RECOGNITION / SPEAKER INDEP.	4
72	SP	TECHNO L.	SPEECH-TO-TEXT / SYNTHESIS	4
73	SP	TECHNO L.	SPEECH-TO-TEXT / CONCAT.	4
78	SP	TECHNO L.	SIGNAL PROCESSING / SPEECH COMPRESSION	4
102	TR	TECHNO L.	MACHINE TRANSLATION / SINGLE LANGUAGE	4
103	TR	TECHNO L.	MACHINE TRANSLATION / MULTIPLE LANGS.	4
104	TR	TECHNO L.	MACHINE TRANSLATION / ENGINES	4
109	TR	TECHNO L.	MACHINE TRANSLATION / ON-SITE INSTALL	4
111	TR	TECHNO L.	MACHINE TRANSLATION / WEB-BASED	4
113	TR	TECHNO L.	TRANSLATION MEMORY / MULTIPLE LANGS.	4
114	TR	TECHNO L.	TRANSLATION MEMORY / MULTILINGUAL INTERFACE	4
117	TR	TECHNO L.	TRANSLATION MEMORY / INTEGRATION	4
119	TR	TECHNO L.	TRANSLATION MEMORY / LEVERAGE FILE	4
122	TR	TECHNO L.	TERMINOLOGY / LANGUAGE PAIRS	4
123	TR	TECHNO L.	TERMINOLOGY / MULTILINGUAL INTERFACE	4

TABLE 9. TOP-RANKING SOFTWARE BY STANDARDS COMPLIANCE

1.1.2.2.5. Lifetime

THE FOLLOWING IS THE EVALUATION SCALE IN USE FOR THE LIFETIME ATTRIBUTE:

Attribute	Interpretation	Evaluation scale					
		0	1	2	3	4	5
LIFETIME	PRODUCT LIFETIME OF X	N/A	LESS THAN ONE YEAR	ONE YEAR	FIVE YEARS	TEN YEARS	N/A

THE FOLLOWING ARE THE TOP-RANKING SOFTWARE ITEMS BY LIFETIME:

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	LIFETIME
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PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	LIFETIME
APPLICATIONS				
60	LT	APP./PL.	COURSEWARE AUTHORIZING TOOLS/LEARNING MANAGEMENT SYSTEMS	4
81	SP	APP.	CALL CENTRES, WEB PORTALS	4
82	SP	APP.	INTERACTIVE VOICE RESPONSE	4
83	SP	APP.	DIRECTORY ASSISTANCE	4
85	SP	APP.	IN-CAR SPEECH	4
87	SP	APP.	DESKTOP DICTATION	4
88	SP	APP.	DESKTOP CMD/CTRL	4
89	SP	APP.	BROADCAST NEWS	4
90	SP	APP.	TRANSCRIPTION TOOLS & SERVICES (MOSTLY MEDICAL)	4
91	SP	APP.	UNIFIED MESSAGING	4
93	SP	APP.	SECURITY	4
94	SP	APP.	HOME AUTOMATION	4
95	SP	APP.	ASSISTIVE TECHNOLOGY	4
96	SP	APP.	AUDIOVISUAL INDEX/SEARCH	4
100	SP	APP.	CLOSED CAPTIONING	4
101	SP	APP.	AUTOMATIC TRANSCRIPTION	4
136	TR	APP.	MACHINE TRANSLATION / INSTALLED CLIENT	4
138	TR	APP.	MACHINE TRANSLATION / ENGINES	4
141	TR	APP.	TRANSLATION MEMORY / INSTALLED CLIENT	4
142	TR	APP.	TRANSLATION MEMORY / WEB-BASED	4
143	TR	APP.	TRANSLATION MEMORY / SEARCH	4
147	TR	APP.	TRANSLATION MEMORY / LEVERAGE BY FILE	4
151	TR	APP.	WORKFLOW SYSTEMS / WEB-BASED	4
RESOURCES				
8	CM	RES.	MULTILINGUAL TERMINOLOGIES	4
9	CM	RES.	ONTOLOGIES	4
10	CM	RES.	PARALLEL CORPORA	4
11	CM	RES.	WRITTEN CORPORA	4
15	LT	RES.	SUBSCRIPTION WEB SITE PROVIDING ONLINE LEARNING MATERIALS FOR TEACHERS, AND MATCHING A NATIONAL CURRICULUM	4
19	LT	RES.	ONLINE LITERATURE LIBRARIES WITH INDIVIDUAL VOCABULARY LINKS AND/OR SPEECH MODELING	4
21	LT	RES.	STANDARDS-BASED TEACHER RESOURCE TO HELP TEACHERS WITH TECHNOLOGY USE	4
24	LT	RES.	ONLINE DICTIONARIES	4
TECHNOLOGY / TOOLS				
12	CM	TOOL	ONTOLOGY ACQ./MAINT.	4
13	CM	TOOL	TERMINOLOGY ACQ./MAINT.	4
38	LT	TOOL	TELEVISION/RADIO DELIVERY OF LANGUAGE TRAINING CONTENT BACKED BY STUDY MATERIALS	4
49	LT	TOOL	TECHNOLOGY-ENABLED ASSESSMENT FOR EMPLOYMENT CERTIFICATION	4
63	SP	TECHNO L.	SPEECH RECOGNITION / EMBEDDED	4
64	SP	TECHNO L.	SPEECH RECOGNITION / SPEAKER DEP.	4
65	SP	TECHNO L.	SPEECH RECOGNITION / SPEAKER INDEP.	4
66	SP	TECHNO L.	SPEECH RECOGNITION / LARGE VOCAB.	4
72	SP	TECHNO L.	SPEECH-TO-TEXT / SYNTHESIS	4
73	SP	TECHNO	SPEECH-TO-TEXT / CONCAT.	4

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	LIFETIME
		L.		
74	SP	TECHNO L.	VOICE BIOMETRICS / SPEAKER ID	4
75	SP	TECHNO L.	VOICE BIOMETRICS / SPEAKER VERIF.	4
78	SP	TECHNO L.	SIGNAL PROCESSING / SPEECH COMPRESSION	4
105	TR	TECHNO L.	MACHINE TRANSLATION / CONTROLLED INPUT	4
113	TR	TECHNO L.	TRANSLATION MEMORY / MULTIPLE LANGS.	4
114	TR	TECHNO L.	TRANSLATION MEMORY / MULTILINGUAL INTERFACE	4
117	TR	TECHNO L.	TRANSLATION MEMORY / INTEGRATION	4
119	TR	TECHNO L.	TRANSLATION MEMORY / LEVERAGE FILE	4
122	TR	TECHNO L.	TERMINOLOGY / LANGUAGE PAIRS	4
123	TR	TECHNO L.	TERMINOLOGY / MULTILINGUAL INTERFACE	4
124	TR	TECHNO L.	TERMINOLOGY / WEB-BASED	4
132	TR	TECHNO L.	WORKFLOW / WEB-BASED	4

TABLE 10. TOP-RANKING SOFTWARE BY LIFETIME

1.1.2.2.6. Cross-over

THE FOLLOWING IS THE EVALUATION SCALE IN USE FOR THE CROSS-OVER ATTRIBUTE:

Attribute	Interpretation	Evaluation scale					
		0	1	2	3	4	5
CROSS-OVER	USEFUL FOR X OTHER SUBSECTORS	N/A	0	1	2	3	N/A

THE FOLLOWING TABLE LISTS THE TOP-RANKING SOFTWARE BY CROSS-OVER. NO RANKING FOR APPLICATIONS IS PROVIDED, AS THE RELEVANT INFORMATION IS NOT AVAILABLE FOR ALL SUBSECTORS.

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	CROSS-OVER
RESOURCES				
8	CM	RES.	MULTILINGUAL TERMINOLOGIES	4
9	CM	RES.	ONTOLOGIES	4
10	CM	RES.	PARALLEL CORPORA	4
11	CM	RES.	WRITTEN CORPORA	4
19	LT	RES.	ONLINE LITERATURE LIBRARIES WITH INDIVIDUAL VOCABULARY LINKS AND/OR SPEECH MODELING	4
22	LT	RES.	MULTILINGUAL DICTIONARY SOFTWARE ON CELL PHONE OR PDA FOR TRANSLATION AND LANGUAGE TRAINING	4
24	LT	RES.	ONLINE DICTIONARIES	4
TECHNOLOGY/ TOOLS				
12	CM	TOOL	ONTOLOGY ACQ./MAINT.	4
13	CM	TOOL	TERMINOLOGY ACQ./MAINT.	4
63	SP	TECHNO L.	SPEECH RECOGNITION / EMBEDDED	4
64	SP	TECHNO L.	SPEECH RECOGNITION / SPEAKER DEP.	4
65	SP	TECHNO L.	SPEECH RECOGNITION / SPEAKER INDEP.	4
66	SP	TECHNO L.	SPEECH RECOGNITION / LARGE VOCAB.	4
67	SP	TECHNO L.	SPEECH RECOGNITION / NOISY ENVTS	4
69	SP	TECHNO L.	SPEECH RECOGNITION / TOPIC SPOTTING	4
71	SP	TECHNO L.	SPEECH RECOGNITION / LIP READING	4
72	SP	TECHNO L.	SPEECH-TO-TEXT / SYNTHESIS	4
73	SP	TECHNO L.	SPEECH-TO-TEXT / CONCAT.	4
74	SP	TECHNO L.	VOICE BIOMETRICS / SPEAKER ID	4
76	SP	TECHNO L.	VOICE BIOMETRICS / LIE DETECTION	4
77	SP	TECHNO L.	SIGNAL PROCESSING / AUDIO CLASSIF.	4
78	SP	TECHNO L.	SIGNAL PROCESSING / SPEECH COMPRESSION	4
79	SP	TECHNO L.	NATURAL LANGUAGE PROCESSING / GENERATION	4
80	SP	TECHNO L.	NATURAL LANGUAGE PROCESSING / CONVERS. AGENTS	4
104	TR	TECHNO L.	MACHINE TRANSLATION / ENGINES	4
105	TR	TECHNO L.	MACHINE TRANSLATION / CONTROLLED INPUT	4
107	TR	TECHNO L.	MACHINE TRANSLATION / DATA MINING	4
108	TR	TECHNO L.	MACHINE TRANSLATION / BIDIRECTIONAL	4
110	TR	TECHNO	MACHINE TRANSLATION / INTEGRATION	4

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	CROSS-OVER
		L.		
111	TR	TECHNO L.	MACHINE TRANSLATION / WEB-BASED	4
113	TR	TECHNO L.	TRANSLATION MEMORY / MULTIPLE LANGS.	4
114	TR	TECHNO L.	TRANSLATION MEMORY / MULTILINGUAL INTERFACE	4
115	TR	TECHNO L.	TRANSLATION MEMORY / WEB-BASED	4
116	TR	TECHNO L.	TRANSLATION MEMORY / ON-SITE INSTALL	4
117	TR	TECHNO L.	TRANSLATION MEMORY / INTEGRATION	4
119	TR	TECHNO L.	TRANSLATION MEMORY / LEVERAGE FILE	4
120	TR	TECHNO L.	TRANSLATION MEMORY / LEVERAGE COMPANY	4
121	TR	TECHNO L.	TRANSLATION MEMORY / LEVERAGE INDUSTRY	4
122	TR	TECHNO L.	TERMINOLOGY / LANGUAGE PAIRS	4
123	TR	TECHNO L.	TERMINOLOGY / MULTILINGUAL INTERFACE	4
124	TR	TECHNO L.	TERMINOLOGY / WEB-BASED	4
125	TR	TECHNO L.	TERMINOLOGY / ON-SITE INSTALL	4
128	TR	TECHNO L.	WORKFLOW / TRANSLATION SPECIFIC	4
129	TR	TECHNO L.	WORKFLOW / ADAPTED	4
131	TR	TECHNO L.	WORKFLOW / ON-SITE INSTALL	4
132	TR	TECHNO L.	WORKFLOW / WEB-BASED	4

TABLE 11. TOP-RANKING SOFTWARE BY CROSS-OVER

1.1.2.2.7. Cumulative results

THIS SECTION PROVIDES CUMULATIVE RESULTS FOR ALL ITEMS UNDER EVALUATION. A SEPARATE LIST IS PROVIDED FOR EACH OF THE THREE BROAD SOFTWARE CATEGORIES UNDER CONSIDERATION: APPLICATIONS, RESOURCES, AND TECHNOLOGY/ TOOLS. FOR EACH CATEGORY THE RELEVANT TABLE RANKS THE SOFTWARE BY A COMBINED SCORE, WHICH IS THE SUM OF THE INDIVIDUAL SCORES FOR ALL THE ATTRIBUTES THAT ARE SHARED BY ALL SUB-SECTORS.

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	NATIONAL MARKET	INTERNATIONAL MARKET	DEVELOPMENT COST	END-USER RETURN ON INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	COMBINED SCORE
82	SP	APP.	INTERACTIVE VOICE RESPONSE	3	4	3	4	4	4	22
87	SP	APP.	DESKTOP DICTATION	3	3	4	4	4	4	22
88	SP	APP.	DESKTOP CMD/CTRL	3	3	3	4	4	4	21
81	SP	APP.	CALL CENTRES, WEB PORTALS	3	3	2	4	4	4	20
59	LT	APP./PL.	ONLINE TESL COURSES	3	3	3	4	3	3	19
60	LT	APP./PL.	COURSEWARE AUTHORING TOOLS/LEARNING MANAGEMENT SYSTEMS	4	4	1	2	4	4	19
90	SP	APP.	TRANSCRIPTION	3	3	3	4	2	4	19
91	SP	APP.	UNIFIED MESSAGING	3	3	2	3	4	4	19
92	SP	APP.	EMBEDDED SR	3	4	2	4	3	3	19
141	TR	APP.	TRANSLATION MEMORY / INSTALLED CLIENT	3	3	2	3	4	4	19
143	TR	APP.	TRANSLATION MEMORY / SEARCH	3	3	4	3	2	4	19
147	TR	APP.	TRANSLATION MEMORY / LEVERAGE BY FILE	2	2	3	3.5	4	4	18.5
51	LT	APP./PL.	HOSTING AND SUPPORT OF E-LEARNING PROGRAMS	3	3	2	3	4	3	18
83	SP	APP.	DIRECTORY ASSISTANCE	3	3	1	3	4	4	18
84	SP	APP.	OUTBOUND DIALLING	3	3	2	4	4	2	18
85	SP	APP.	IN-CAR SPEECH	2	4	1	3	4	4	18
142	TR	APP.	TRANSLATION MEMORY / WEB-BASED	4	4	1	3.5	1	4	17.5
146	TR	APP.	TRANSLATION MEMORY / FILE CONVERSION	2	2	4	3.5	4	2	17.5
151	TR	APP.	WORKFLOW SYSTEMS / WEB-BASED	4	4	1	3.5	1	4	17.5
2	CM	APP.	DIALOGUE	4	4	1	3	2	3	17
3	CM	APP.	INTELLIGENT SPEECH-TO-TEXT	4	4	1	3	2	3	17
4	CM	APP.	MULTILING. QA	4	4	1	3	2	3	17
5	CM	APP.	UNSTRUC. IR	4	4	1	3	2	3	17
6	CM	APP.	TEXT ANALYTICS	4	4	1	3	2	3	17
7	CM	APP.	TEXT GENERATOR	4	4	1	3	2	3	17
61	LT	APP./PL.	SKILL-SPECIFIC APPLICATIONS DEVELOPED ACCORDING TO NATIONAL STANDARDS	3	3	2	2	4	3	17
62	LT	APP./PL.	ASSESSMENT AND PROGRESS MANAGEMENT SYSTEMS DEVELOPED ACCORDING TO NATIONAL STANDARDS	3	3	2	2	4	3	17
96	SP	APP.	AUDIOVISUAL INDEX/SEARCH	3	4	1	2	3	4	17
138	TR	APP.	MACHINE TRANSLATION / ENGINES	4	2	1	2.6	3	4	16.6
137	TR	APP.	MACHINE TRANSLATION / WEB-BASED	3	3	1	3.5	3	3	16.5
145	TR	APP.	TRANSLATION MEMORY / LEVERAGING	3	3	2	3.5	2	3	16.5
136	TR	APP.	MACHINE TRANSLATION / INSTALLED CLIENT	3	3	1	2.4	3	4	16.4
50	LT	APP./PL.	APPLICATIONS FOR DELIVERY OF FULLY CUSTOMIZED ONLINE LANGUAGE TRAINING SCHOOL	3	3	1	3	3	3	16
52	LT	APP./PL.	VIRTUAL DIGITAL LANGUAGE LABORATORIES	3	3	2	2	3	3	16
53	LT	APP./PL.	ONLINE PROFESSIONAL DEVELOPMENT RESOURCES FOR TEACHERS AND ADMINISTRATORS	3	3	1	2	4	3	16
54	LT	APP./PL.	SPEECH ANALYSIS AND FEEDBACK SOFTWARE ON MOBILE DEVICES	3	4	2	2	2	3	16
55	LT	APP./PL.	ONLINE ASSESSMENT SYSTEMS FOLLOWING NATIONAL STANDARDS	2	3	2	2	4	3	16
95	SP	APP.	ASSISTIVE TECHNOLOGY	2	2	1	3	4	4	16
139	TR	APP.	MACHINE TRANSLATION / DATA MINING	4	2	2	3	2	3	16
148	TR	APP.	TRANSLATION MEMORY / LEVERAGE BY COMPANY	3	3	2	3	2	3	16
1	CM	APP.	CLIR	3	3	1	3	2	3	15
56	LT	APP./PL.	SUBSCRIPTION-BASED ONLINE LANGUAGE LEARNING APPLICATIONS FOR MOBILE DEVICES	2	3	3	2	3	2	15
58	LT	APP./PL.	ASSESSMENT AUTHORING APPLICATIONS	2	2	3	3	2	3	15

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	NATIONAL MARKET	INTERNATIONAL MARKET	DEVELOPMENT COST	END-USER RETURN ON INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	COMBINED SCORE
93	SP	APP.	SECURITY	2	3	2	3	1	4	15
140	TR	APP.	MACHINE TRANSLATION / GISTING	4	3	1	3	1	3	15
149	TR	APP.	TRANSLATION MEMORY / LEVERAGE BY INDUSTRY	4	4	1	2.6	1	2	14.6
152	TR	APP.	WORKFLOW SYSTEMS / ADAPTED FOR TRANSLATION	3	3	2	2.6	1	3	14.6
94	SP	APP.	HOME AUTOMATION	2	2	1	3	2	4	14
98	SP	APP.	DUBBING	2	3	2	2	2	3	14
99	SP	APP.	DIGITAL AUDIO POST-PROD.	2	3	2	2	2	3	14
100	SP	APP.	CLOSED CAPTIONING	2	2	1	2	3	4	14
101	SP	APP.	TRANSCRIPTION	2	2	1	2	3	4	14
144	TR	APP.	TRANSLATION MEMORY / ALIGNMENT	3	3	1	2.4	1	3	13.4
150	TR	APP.	WORKFLOW SYSTEMS / INSTALLED	3	2	2	2.4	1	3	13.4
57	LT	APP./PL.	TEXT TO SPEECH APPLICATIONS	2	2	3	2	1	3	13
89	SP	APP.	BROADCAST NEWS	2	2	1	2	2	4	13
86	SP	APP.	PROFICIENCY TESTING	2	2	1	3	1	2	11
97	SP	APP.	SPEECH-TO-SPEECH TRANSL.	2	2	1	2	1	2	10

IN ADDITION TO THE ATTRIBUTES USED FOR APPLICATIONS, THE FOLLOWING TABLE FOR RESOURCES ALSO INCLUDES THE *CROSS-OVER* ATTRIBUTE.

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	NATIONAL MARKET	INTERNATIONAL MARKET	DEVELOPMENT COST	END-USER RETURN ON INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	CROSS-OVER	COMBINED SCORE
15	LT	RES.	SUBSCRIPTION WEB SITE PROVIDING ONLINE LEARNING MATERIALS FOR TEACHERS, AND MATCHING A NATIONAL CURRICULUM	3	3	2	2	4	4	2	20
16	LT	RES.	MAJOR MEDIA OUTLETS WITH EDUCATION NEWS AND RESOURCES	3	3	3	2	3	3	2	19
22	LT	RES.	MULTILINGUAL DICTIONARY SOFTWARE ON CELL PHONE OR PDA FOR TRANSLATION AND LANGUAGE TRAINING	3	4	2	2	1	3	4	19
21	LT	RES.	STANDARDS-BASED TEACHER RESOURCE TO HELP TEACHERS WITH TECHNOLOGY USE	3	3	1	2	4	4	1	18
23	LT	RES.	SUBSCRIPTION-BASED RESOURCE SITES SPECIFICALLY FOR ESL TEACHERS	2	3	3	2	3	3	2	18
25	LT	RES.	INTERACTIVE DICTIONARIES	2	2	4	2	3	3	2	18
10	CM	RES.	PARALLEL CORPORA	1	1	3	2	2	4	4	17
11	CM	RES.	WRITTEN CORPORA	1	1	3	2	2	4	4	17
17	LT	RES.	GLOBAL INTERNET NETWORKS PARTNERING LANGUAGE LEARNERS WITH EACH OTHER	2	3	3	2	1	3	3	17
18	LT	RES.	INTERNET DIRECTORIES OF STUDY-ABROAD OPPORTUNITIES FOR DOMESTIC AND INTERNATIONAL STUDENTS	3	3	3	2	1	3	2	17
19	LT	RES.	ONLINE LITERATURE LIBRARIES WITH INDIVIDUAL VOCABULARY LINKS AND/OR SPEECH MODELING	2	2	3	1	1	4	4	17

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	NATIONAL MARKET	INTERNATIONAL MARKET	DEVELOPMENT COST	END-USER RETURN ON INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	CROSS-OVER	COMBINED SCORE
20	LT	RES.	ONLINE REPOSITORIES OF INFORMATION ON THE LANGUAGE TRAINING INDUSTRY, WITH CONSULTING	2	2	3	2	3	2	3	17
24	LT	RES.	ONLINE DICTIONARIES	2	2	3	1	1	4	4	17
8	CM	RES.	MULTILINGUAL TERMINOLOGIES	1	1	2	2	2	4	4	16
9	CM	RES.	ONTOLOGIES	1	1	2	2	2	4	4	16
14	LT	RES.	WEB SITE WITH LESSON PLAN RESOURCES FOR TEACHERS AND/OR ACTIVITY RESOURCES FOR STUDENTS	1	2	3	3	1	3	3	16
26	LT	RES.	COMPANION WEBSITE TO TEXTBOOKS/TEXT ENRICHMENT SITES/ONLINE COURSE SUPPORT	2	2	3	1	3	3	2	16

THE FOLLOWING TABLE FOR TECHNOLOGY / TOOLS INCLUDES THE SAME ATTRIBUTES USED FOR RESOURCES, WITH THE ONLY EXCEPTION OF *DEVELOPMENT COST*.

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	NATIONAL MARKET	INTERNATIONAL MARKET	END-USER RETURN ON INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	CROSS-OVER	COMBINED SCORE
78	SP	TECHNO L.	SIGNAL PROCESSING / SPEECH COMPRESSION	4	4	4	4	4	4	24
111	TR	TECHNO L.	MACHINE TRANSLATION / WEB-BASED	3	4	5	4	3	4	23
64	SP	TECHNO L.	SPEECH RECOGNITION / SPEAKER DEP.	3	3	4	4	4	4	22
72	SP	TECHNO L.	SPEECH-TO-TEXT / SYNTHESIS	3	3	4	4	4	4	22
73	SP	TECHNO L.	SPEECH-TO-TEXT / CONCAT.	3	3	4	4	4	4	22
124	TR	TECHNO L.	TERMINOLOGY / WEB-BASED	3	3	5	3	4	4	22
117	TR	TECHNO L.	TRANSLATION MEMORY / INTEGRATION	3	3	3.5	4	4	4	21.5
63	SP	TECHNO L.	SPEECH RECOGNITION / EMBEDDED	3	3	3	4	4	4	21
65	SP	TECHNO L.	SPEECH RECOGNITION / SPEAKER INDEP.	3	3	3	4	4	4	21
115	TR	TECHNO L.	TRANSLATION MEMORY / WEB-BASED	4	4	5	1	3	4	21
119	TR	TECHNO L.	TRANSLATION MEMORY / LEVERAGE FILE	2	3	3.5	4	4	4	20.5
66	SP	TECHNO L.	SPEECH RECOGNITION / LARGE VOCAB.	3	3	3	3	4	4	20

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	NATIONAL MARKET	INTERNATIONAL MARKET	END-USER RETURN ON INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	CROSS-OVER	COMBINED SCORE
105	TR	TECHNO L.	MACHINE TRANSLATION / CONTROLLED INPUT	3	3	2.8	3	4	4	19.8
116	TR	TECHNO L.	TRANSLATION MEMORY / ON-SITE INSTALL	3	3	3.5	3	3	4	19.5
132	TR	TECHNO L.	WORKFLOW / WEB-BASED	4	4	2.2	1	4	4	19.2
36	LT	TOOL	LANGUAGE LEARNING TOOLS DELIVERED ON MOBILE DEVICES	3	4	3	3	3	3	19
113	TR	TECHNO L.	TRANSLATION MEMORY / MULTIPLE LANGS.	1	1	5	4	4	4	19
114	TR	TECHNO L.	TRANSLATION MEMORY / MULTILINGUAL INTERFACE	1	1	5	4	4	4	19
122	TR	TECHNO L.	TERMINOLOGY / LANGUAGE PAIRS	1	1	5	4	4	4	19
123	TR	TECHNO L.	TERMINOLOGY / MULTILINGUAL INTERFACE	1	1	5	4	4	4	19
102	TR	TECHNO L.	MACHINE TRANSLATION / SINGLE LANGUAGE	3	3	2.8	4	3	3	18.8
103	TR	TECHNO L.	MACHINE TRANSLATION / MULTIPLE LANGS.	3	3	2.8	4	3	3	18.8
108	TR	TECHNO L.	MACHINE TRANSLATION / BIDIRECTIONAL	3	3	2.8	3	3	4	18.8
104	TR	TECHNO L.	MACHINE TRANSLATION / ENGINES	2	2	3.5	4	3	4	18.5
74	SP	TECHNO L.	VOICE BIOMETRICS / SPEAKER ID	2	2	3	3	4	4	18
120	TR	TECHNO L.	TRANSLATION MEMORY / LEVERAGE COMPANY	3	4	2.8	2	2	4	17.8
125	TR	TECHNO L.	TERMINOLOGY / ON-SITE INSTALL	3	3	2.8	2	3	4	17.8
131	TR	TECHNO L.	WORKFLOW / ON-SITE INSTALL	3	3	2.8	2	3	4	17.8
110	TR	TECHNO L.	MACHINE TRANSLATION / INTEGRATION	3	2	3.5	3	2	4	17.5
28	LT	TOOL	STORYBOARD ROLE-PLAY SOFTWARE FOR CHILDREN	3	3	1	4	3	3	17
29	LT	TOOL	FULL SUBSCRIPTION-BASED ONLINE ENGLISH COURSES	3	4	2	3	3	2	17
33	LT	TOOL	LANGUAGE LEARNING SYSTEMS WITH MULTIMEDIA TOOLS (VIDEO, RECORDING, INTERACTIVE TESTS)	3	4	2	3	3	2	17
34	LT	TOOL	IMMERSIVE ENVIRONMENTS FOR SPECIFIC TASK-RELATED LANGUAGE LEARNING	2	3	3	4	2	3	17
38	LT	TOOL	TELEVISION/RADIO DELIVERY OF LANGUAGE TRAINING CONTENT BACKED BY STUDY MATERIALS	3	4	2	3	4	1	17
41	LT	TOOL	ONLINE PRACTICE TOOLS FOR STANDARDIZED ASSESSMENT	3	4	2	4	2	2	17
49	LT	TOOL	TECHNOLOGY-ENABLED ASSESSMENT FOR EMPLOYMENT CERTIFICATION	2	2	3	4	4	2	17
75	SP	TECHNO L.	VOICE BIOMETRICS / SPEAKER VERIF.	2	2	3	3	4	3	17
118	TR	TECHNO L.	TRANSLATION MEMORY / SENTENCE ALIGNMENT	3	3	2.8	2	3	3	16.8
128	TR	TECHNO L.	WORKFLOW / TRANSLATION SPECIFIC	3	3	2.8	1	3	4	16.8

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	NATIONAL MARKET	INTERNATIONAL MARKET	END-USER RETURN ON INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	CROSS-OVER	COMBINED SCORE
129	Tr	TECHNO L.	WORKFLOW / ADAPTED	3	3	2.8	1	3	4	16.8
107	Tr	TECHNO L.	MACHINE TRANSLATION / DATA MINING	3	3	3.5	1	2	4	16.5
126	Tr	TECHNO L.	TERMINOLOGY / TERM EXTRACTION	3	4	3.5	1	2	3	16.5
106	Tr	TECHNO L.	MACHINE TRANSLATION / NON-STRUCTURED INPUT	4	4	2.2	1	2	3	16.2
121	Tr	TECHNO L.	TRANSLATION MEMORY / LEVERAGE INDUSTRY	4	4	2.2	1	1	4	16.2
27	LT	TOOL	MULTILINGUAL CD-BASED OR ONLINE LANGUAGE LEARNING SOFTWARE	3	3	2	3	3	2	16
31	LT	TOOL	GAME-BASED SOFTWARE ON CD FOR LANGUAGE LEARNING	3	3	1	4	2	3	16
39	LT	TOOL	GRAMMAR CHECKING SOFTWARE FOR CORPORATE COMMUNICATION	3	3	3	1	3	3	16
40	LT	TOOL	ACCREDITED HOME STUDY PROGRAMS	3	2	2	4	3	2	16
43	LT	TOOL	ONLINE TEXTBOOKS	3	3	2	3	3	2	16
45	LT	TOOL	SPECIAL-PURPOSE ONLINE LANGUAGE TRAINING	3	3	3	2	3	2	16
48	LT	TOOL	INDUSTRY-SPECIFIC LANGUAGE TRAINING SOFTWARE	2	3	3	3	3	2	16
127	Tr	TECHNO L.	TERMINOLOGY / INDUSTRY SPECIFIC	3	3	2.8	2	2	3	15.8
130	Tr	TECHNO L.	WORKFLOW / COMPANY SPECIFIC	3	3	2.8	1	3	3	15.8
109	Tr	TECHNO L.	MACHINE TRANSLATION / ON-SITE INSTALL	3	3	3.5	4	1	1	15.5
32	LT	TOOL	TRAVELLING PHRASEBOOK SOFTWARE FOR IPOD	3	3	2	1	3	3	15
35	LT	TOOL	ONLINE VOCABULARY ASSESSMENT AND DEVELOPMENT TOOLS	2	2	1	4	3	3	15
37	LT	TOOL	ONLINE LANGUAGE TRAINING TOOL SUPPORTED BY PEER-TO-PEER LEARNER AND TRAINER INTERACTION	2	3	1	4	3	2	15
42	LT	TOOL	ISSUE-BASED INTERACTIVE SOFTWARE	3	3	2	2	3	2	15
44	LT	TOOL	STAND-ALONE COMPUTER LANGUAGE ASSESSMENT TOOLS	2	3	3	3	3	1	15
67	SP	TECHNO L.	SPEECH RECOGNITION / NOISY ENVTS	2	2	2	2	3	4	15
133	Tr	TECHNO L.	RESOURCING / MLV	3	3	5	2	1	1	15
134	Tr	TECHNO L.	RESOURCING / SLV	3	3	5	2	1	1	15
135	Tr	TECHNO L.	RESOURCING / TRANSLATOR DIRECT WEB	3	3	5	2	1	1	15
12	CM	TOOL	ONTOLOGY ACQ./MAINT.	1	1	2	2	4	4	14
13	CM	TOOL	TERMINOLOGY ACQ./MAINT.	1	1	2	2	4	4	14
47	LT	TOOL	BUSINESS COMMUNICATION SOFTWARE	3	3	3	1	3	1	14
68	SP	TECHNO L.	SPEECH RECOGNITION / AUDIO MINING	2	2	2	3	3	2	14
69	SP	TECHNO L.	SPEECH RECOGNITION / TOPIC SPOTTING	2	2	2	2	2	4	14
77	SP	TECHNO L.	SIGNAL PROCESSING / AUDIO CLASSIF.	2	1	2	2	3	4	14

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	NATIONAL MARKET	INTERNATIONAL MARKET	END-USER RETURN INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	CROSS-OVER	COMBINED SCORE
79	SP	TECHNO L.	NATURAL LANGUAGE PROCESSING / GENERATION	2	1	2	1	3	4	13
30	LT	TOOL	SKILL-SPECIFIC (I.E. PRONUNCIATION, LISTENING) SOFTWARE, CD-BASED OR ONLINE	2	3	2	1	2	2	12
46	LT	TOOL	FREWARE / SHAREWARE TOOLS AVAILABLE FOR COST-EFFECTIVE LICENSE	2	2	2	1	3	2	12
70	SP	TECHNO L.	SPEECH RECOGNITION / PROFICIENCY ANALYSIS	2	2	2	1	2	2	11
76	SP	TECHNO L.	VOICE BIOMETRICS / LIE DETECTION	1	1	2	1	2	4	11
112	Tr	TECHNO L.	MACHINE TRANSLATION / ERROR DETECTION	1	1	2.8	1	2	3	10.8
71	SP	TECHNO L.	SPEECH RECOGNITION / LIP READING	1	1	2	1	1	4	10
80	SP	TECHNO L.	NATURAL LANGUAGE PROCESSING / CONVERS. AGENTS	1	1	2	1	1	4	10

1.1.3. Prioritization of technologies

THE PRESENT SECTION DISCUSSES HOW THE TECHNOLOGY DEVELOPMENT GUIDELINES AND THE EVALUATION DATA ILLUSTRATED SO FAR CAN BE COMBINED TO PRIORITIZE TECHNOLOGY.

1.1.3.1. CRITICAL ASSESSMENT OF EVALUATION DATA

THE EVALUATION DATA ILLUSTRATED ABOVE PROVIDE A VALUABLE AMOUNT OF INFORMATION, IN A FORMAT SUITABLE FOR ALGORITHMIC PROCESSING AND MANIPULATION. SUCH DATA PROVIDE THE CORE INFORMATION TO BE USED IN PRIORITIZING TECHNOLOGIES. HOWEVER, IT IS ARGUABLE WHETHER SUCH DATA, ALONG WITH SOME SUITABLE PROCESSING SCHEME, ARE SUFFICIENT TO ALGORITHMICALLY GENERATE A SET OF TECHNOLOGIES TO BE PRIORITIZED. RATHER, IT SEEMS MORE REASONABLE AND REALISTIC TO USE SUCH DATA AND THE FRAMEWORK IN WHICH THEY ARE PROVIDED AS A MEANS TO JUSTIFY PRIORITIZATION DECISIONS. IN OTHER WORDS, IT WOULD SEEM REASONABLE TO REQUIRE THAT A PROPOSAL TO PRIORITIZE TECHNOLOGY A OVER TECHNOLOGY B BE SUPPORTED BY EXHIBITING A CRITERION SUCH THAT EVALUATION DATA ASSIGN A HIGHER SCORE TO TECHNOLOGY A THAN TO TECHNOLOGY B. SUCH A CRITERION WOULD CONSTITUTE AN EXPLICIT, VERIFIABLE METRICS FOR PRIORITIZATION AMONG TECHNOLOGIES THAT WERE PUT FORWARD AS CANDIDATES BY SOME UNSPECIFIED PROCESS. THIS PRIORITIZATION SCENARIO WILL BE ASSUMED AS A WORKING HYPOTHESIS IN THE REST OF THIS DOCUMENT, AND WILL BE THE BASIS FOR THE FOLLOWING DISCUSSION.

IN THIS SPIRIT, IT WAS SUGGESTED IN THE PREVIOUS DISCUSSION ABOUT TECHNOLOGY DEVELOPMENT STRATEGY THAT A PRELIMINARY STEP BE UNDERTAKEN, DURING WHICH SOME CONSENSUS IS REACHED ABOUT GENERAL STRATEGIC GUIDELINES. THESE WOULD ACT AS A FILTER ON THE TECHNOLOGY SCENARIOS TO BE CONSIDERED FOR EVALUATION AND PRIORITIZATION. AS PREVIOUSLY DISCUSSED, ONE PRELIMINARY POINT ON WHICH CONSENSUS SEEM TO EXIST IS THE

ADOPTION OF A THREE-FOLD DISTINCTION BETWEEN APPLICATIONS, TECHNOLOGIES, AND RESOURCES. FURTHERMORE, IT WAS SUGGESTED THAT THE SAME DISTINCTION BE USED TO PRELIMINARILY ESTABLISH SOME DIVISION OF LABOUR AMONG DIFFERENT SUB-SECTOR, SO AS TO ESTABLISH THE RESPECTIVE ROLES AS TECHNOLOGY-GIVERS, TECHNOLOGY-RECEIVERS, RESOURCE-DEVELOPERS, ETC. SUCH A PRELIMINARY CONSENSUS WOULD SIGNIFICANTLY REDUCE THE SEARCH SPACE FOR TECHNOLOGIES TO BE PRIORITIZED, BY FILTERING OUT UNSUITABLE SCENARIOS. SUCH A PRELIMINARY STEP WOULD ALSO HELP THE PRIORITIZATION PROCESS TO LEVERAGE, RATHER THEN BEING HINDERED, FROM THE EVALUATION DISPARITIES EXISTING AMONG SUB-SECTORS.

IN ADDITION IT WAS SUGGESTED THAT THE ATTRIBUTES COMMON TO ALL SUB-SECTORS MIGHT CONSTITUTE A SUITABLE SET OF CRITICAL ATTRIBUTES TO BE PRIORITIZED IN EVALUATING TECHNOLOGIES. THE TABLE IN SECTION *CUMULATIVE RESULTS* IS A TENTATIVE EXAMPLE OF THIS SORT OF EVALUATION. ONE CAN THINK OF MANY WAYS IN WHICH THE EVALUATION DATA AND METRICS COULD BE EXTENDED, INTEGRATED, AND REFINED. FOR EXAMPLE:

- NEW ATTRIBUTES COULD BE ADDED, AND GAPS FOR EXISTING ATTRIBUTES COULD BE FILLED, SO AS TO EXTEND THE NUMBER OF COMMON ATTRIBUTES ACROSS SUB-SECTORS.
- A COMBINED SCORE COULD BE REFINED BY ASSIGNING WEIGHTS TO THE CRITICAL ATTRIBUTES COMPRISING THE COMBINED SCORE, SO AS TO PRIORITIZE MORE RELEVANT ATTRIBUTES OVER LESS RELEVANT ONES.
- CURRENTLY, EVALUATION IS PROVIDED FOR SINGLE TECHNOLOGY ITEMS IN ISOLATION. HOWEVER, A TECHNOLOGY DEVELOPMENT SCENARIO IS MORE LIKELY TO INCLUDE A CLUSTER OF RELATED APPLICATIONS, TOOLS, AND RESOURCES. ACCORDINGLY, A COMBINED SCORE COULD BE DEvised NOT ONLY IN TERMS OF DIFFERENT ATTRIBUTES FOR THE SAME TECHNOLOGY ITEM, BUT ALSO IN TERMS OF A SET OF RELATED TECHNOLOGY ITEMS, THUS ADDING A FURTHER LEVEL OF COMPLEXITY.

OTHER EXTENSIONS COULD BE EASILY DEVISED. AT ANY RATE, WHAT IS BEING SUGGESTED HERE IS THAT: (I) WHATEVER THE EXTENSIONS TO THE EVALUATION DATA, THESE SHOULD DRAW SUPPORTING EVIDENCE FROM THE RICH AMOUNT OF BACKGROUND INFORMATION ALREADY PROVIDED IN THE TECHNOLOGY ROADMAP; AND (II) WHATEVER THE EVALUATION CRITERIA ADOPTED, THESE SHOULD BE EXPLICITLY FORMULATED, SO AS TO BE VERIFIABLE AND GENERALLY APPLICABLE. IN THIS WAY, POSSIBLY THROUGH SEVERAL ITERATIONS, IT CAN BE HOPED THAT INTERESTED PARTIES COME TO A COMMON UNDERSTANDING, THAT SUGGESTIONS COMING FROM SPECIFIC SUB-SECTORS BE SUBSTANTIATED BY A PROCESS OF CROSS-SECTOR VALIDATION AND CONSENSUS, AND THAT THE ROADMAPPING PROCESS END UP WITH A SELF-CONTAINED, EXHAUSTIVE DOCUMENT.

THE REST OF THIS SECTION DISCUSSES INTEGRATIONS TO THE EVALUATION DATA PROVIDED ELSEWHERE BY THE SUB-COMMITTEES, OR SUGGESTIONS FOR PRIORITIZATION COMING FROM THE DOCUMENTS PRODUCED IN THE COURSE OF THE ROADMAPPING PROCESS. BY PROVIDING A DISCUSSION OF SUCH INFORMAL INTEGRATIONS AND SUGGESTIONS, IT IS HOPED TO FURTHER ILLUSTRATE THE WAY IN WHICH THE ROADMAPPING PROCESS CAN BE FURTHER CARRIED FORWARD IN ORDER TO ACHIEVE AN EXPLICIT, ADEQUATE PRIORITIZATION CRITERION.

1.1.3.2. *CROSS-OVER*

AS WAS PREVIOUSLY DISCUSSED, IT IS USEFUL TO MAKE A DISTINCTION BETWEEN THREE DIFFERENT KINDS OF CROSS-OVER, HOLDING RESPECTIVELY BETWEEN APPLICATIONS, BETWEEN

TECHNOLOGIES, AND BETWEEN TECHNOLOGIES AND APPLICATIONS. HOWEVER, THE EVALUATION DATA USE A SINGLE, UNSPECIFIED *CROSS-OVER* ATTRIBUTE THAT HOLDS BETWEEN A SPECIFIC SOFTWARE ITEM AND ONE OR MORE OTHER SUB-SECTORS. WHILE IT IS KNOWN WHETHER THE SOFTWARE ITEM UNDER DISCUSSION IS AN APPLICATION, A RESOURCE, A TECHNOLOGY, OR A TOOL, IT IS NOT ALWAYS CLEAR WHAT KIND OF SOFTWARE IN THE TARGET SECTOR IS INVOLVED IN A CROSS-OVER RELATION WITH THE SOFTWARE ITEM UNDER CONSIDERATION. FURTHERMORE, IN SOME CASES THE EVALUATION TABLE SPECIFIES THAT CROSS-OVER EXISTS WITH ONE OR MORE OTHER SUB-SECTORS, BUT IT DOES NOT SPECIFY WHAT OTHER SUB-SECTORS ARE INVOLVED. SINCE CROSS-OVER IS ONE OF THE MOST RELEVANT ATTRIBUTES FOR THE PRESENT EVALUATION AND PRIORITIZATION, THE FOLLOWING SUB-SECTIONS INTEGRATE THE INFORMATION IN THE EVALUATION TABLE WITH WHATEVER ADDITIONAL INFORMATION CAN BE GLEANED FROM OTHER ROADMAPPING DOCUMENTS PROVIDED BY THE VARIOUS SUB-COMMITTEES. EACH PIECE OF ADDITIONAL INFORMATION IS COMMENTED UPON, IN ORDER TO ILLUSTRATE HOW IT COULD BE USEFULLY INTEGRATED WITH THE INFORMATION ALREADY AVAILABLE IN THE EVALUATION DATA.

1.1.3.2.1. Content Management

FROM PRESENTATION PREPARED BY REJEAN ROY FOR THE CONTENT MANAGEMENT SUB-COMMITTEE, OTTAWA MARCH 23, 2004:

CM TECHNOLOGIES ARE A PREREQUISITE TO:

- THE IMPROVEMENT OF TRANSLATION AIDS AND MACHINE TRANSLATION SOFTWARE.
- THE DEVELOPMENT OF LANGUAGE TEACHING AIDS, E.G. WRITING ASSISTANTS.
- THE CREATION OF SPEECH PROCESSING TOOLS THAT *UNDERSTAND* LANGUAGE (E.G. BETTER AUTOMATIC DICTATION SOFTWARE).

COMMENT: THE INFORMATION ABOVE COULD NOT BE INTEGRATED RIGHT AWAY IN THE EVALUATION TABLE, AS NO *TECHNOLOGY* SOFTWARE CATEGORY WAS USED FOR CONTENT MANAGEMENT. IN TERMS OF CROSS-OVER TYPES, IT SEEMS THAT THE FIRST TWO LINES REFER TO A TECHNOLOGY-APPLICATION RELATION, WHILE THE THIRD LINE REFERS TO A TECHNOLOGY-TECHNOLOGY RELATION, STATING THAT NATURAL LANGUAGE UNDERSTANDING IS A TECHNOLOGY IN COMMON BETWEEN CONTENT MANAGEMENT AND SPEECH PROCESSING.

1.1.3.2.2. Speech Processing

1.1.3.2.2.1. *CROSS-OVER TECHNOLOGIES*

FROM SPEECH PROCESSING SUB-COMMITTEE PRESENTATION FROM MARCH 2004 MEETING:

Speech Processing technology / application	Other subsectors		
	<i>CONTENT MANAGEMENT</i>	<i>LANGUAGE TRAINING</i>	<i>TRANSLATION</i>
DICTATION			✓
AUTOMATIC TRANSCRIPTION			✓
AUDIOVISUAL DOCUMENT INDEXATION & SEARCH (MPEG-7)	✓		
SPEECH PROCESSING ASSISTED LANGUAGE TRAINING		✓	
NATURAL LANGUAGE UNDERSTANDING	✓	✓	✓

SPEECH-TO-SPEECH TRANSLATION			✓
INFORMATION EXTRACTION (AUDIO MINING)	✓		
CONVERSATIONAL AGENTS		✓	✓
SPEECH SYNTHESIS			✓
NATURAL LANGUAGE GENERATION	✓	✓	✓

TABLE 12. SPEECH PROCESSING CROSS-OVER TECHNOLOGIES.

COMMENT: THE TABLE ABOVE PROVIDES CROSS-OVER INFORMATION FOR BOTH SPEECH PROCESSING APPLICATIONS AND TECHNOLOGIES, COLOUR-CODED IN THE USUAL MANNER (YELLOW FOR APPLICATIONS, GREEN FOR TECHNOLOGIES). WHILE THE LATTER KIND OF INFORMATION APPROXIMATELY REPLICATES INFORMATION ALREADY AVAILABLE IN THE EVALUATION TABLE, THE INFORMATION ABOUT APPLICATIONS IS NOT IN THE EVALUATION TABLE, AND THUS REPRESENTS USEFUL ADDITIONAL INFORMATION, THOUGH NOT SYSTEMATIC. WITH RESPECT TO TECHNOLOGIES, THE TABLE ABOVE EMPHASIZES THE CROSS-OVER RELEVANCE OF NATURAL LANGUAGE PROCESSING TECHNOLOGIES, WITH NLU AND NLG SPANNING ACROSS ALL SUB-SECTORS (AS JUST ILLUSTRATED, NLU WAS ALSO MENTIONED BY THE CONTENT MANAGEMENT SUB-COMMITTEE AS A FOREMOST CROSS-OVER TECHNOLOGY). IN ADDITION, CONVERSATIONAL AGENTS, WHICH IN THE EVALUATION TABLE IS EQUALLY CLASSIFIED BY THE SPEECH PROCESSING SUB-COMMITTEE AS A NLP TECHNOLOGY SPANNING ACROSS ALL SUB-SECTORS, IS ALSO LISTED HERE, ALTHOUGH THE PRESENT TABLE OMITTS TO MENTION ITS CROSS-OVER WITH CONTENT MANAGEMENT.

1.1.3.2.2.2. CROSS-OVER APPLICATIONS

FROM *NOTES FROM THE SPEECH PROCESSING SUB-COMMITTEE MARCH 2004 BREAKOUT SESSION:*

- *TRAINING APPLICATIONS*
 - COLLABORATIVE TOOLS. NICHE MARKET NOW, POISED FOR GROWTH: ADD SPEECH RECOGNITION AND SYNTHESIS
- *TRANSLATION*
 - TOOLS INTEGRATION
 - DICTATION (ROI PAYBACK POINT—FASTER TO CORRECT RECOGNIZER TEXT THAN MANUAL ENTRY)
- *CONTENT MANAGEMENT*
 - NATURAL LANGUAGE UNDERSTANDING
 - NATURAL LANGUAGE GENERATION
 - MPEG7 (MULTIMEDIA CONTENT-BASED INDEX & SEARCH)
 - SUMMARIZATION
 - DIALOG MANAGEMENT

Application	Required Technology												
	AUDIO INPUT/OUTPUT	SPEECH RECOGNITION	SPEECH SYNTHESIS	DIALOG MANAGEMENT	CONTENT MANAGEMENT	MPEG7	NATURAL LANGUAGE	NATURAL LANGUAGE	TRANSLATION	MACHINE TRANSLATION	REAL-TIME MULTILINGUAL	LOCALIZATION	IMAGE RECOGNITION
<i>E-LANGUAGE TRAINING</i> (APPLICATIONS: PRONUNCIATION VERIFIER WITH MULTI-MODAL GRAPHICAL USER INTERFACE; LANGUAGE SKILLS TESTING)	✓	✓	✓	✓	✓							✓	
<i>E-DUBBING</i>		✓			✓				✓			✓	
<i>AUTOMATIC TRANSLATION</i>		✓	✓							✓			
<i>AUDIO-TO-AUDIO TRANSLATION</i>		✓	✓				✓		✓				
<i>VIRTUAL CLASSROOM AND MEETING</i>		✓	✓				✓				✓		
<i>AUDIO-VISUAL SEARCH ENGINE</i>		✓			✓	✓							✓
<i>AUTOMATED INFORMATION BOOTH</i>		✓	✓		✓		✓	✓	✓				

COMMENT: THE PRESENT NOTES PROVIDE FURTHER INFORMATION ABOUT CROSS-OVER BETWEEN TECHNOLOGY AND APPLICATIONS CONCERNING SPEECH PROCESSING. THE DATA ARRANGED ABOVE IN MATRIX FORM IS PARTICULARLY NOTABLE, AS IT PROVIDES USEFUL INFORMATION—NOT AVAILABLE IN THE EVALUATION TABLE—ABOUT DEPENDENCIES BETWEEN SPECIFIC TECHNOLOGIES AND SPECIFIC APPLICATIONS. FOR EXAMPLE, THE TABLE ABOVE SHOWS AT A GLANCE THE CLUSTER OF TECHNOLOGIES INVOLVED IN *AUTOMATED INFORMATION BOOTH* APPLICATIONS (SPEECH RECOGNITION AND SYNTHESIS, NLU, NLG, TRANSLATION, ETC.). LIKewise, IT SHOWS AT A GLANCE A RANGE OF APPLICATIONS IN WHICH, E.G., SPEECH RECOGNITION IS REQUIRED. THIS KIND OF INFORMATION, IF GENERALIZED, WOULD ALLOW ONE TO PROVIDE COMBINED SCORES FOR CLUSTERS OF INTER-RELATED TECHNOLOGIES AND APPLICATIONS, SO AS TO MAKE PRIORITIZATION MORE REALISTIC AND COMPLETE, AS WAS PREVIOUSLY SUGGESTED IN SECTION *CRITICAL ASSESSMENT OF EVALUATION DATA*. IT COULD BE SUGGESTED TO UNDERTAKE THIS KIND OF COMBINED SCORING, PERHAPS AS AN ADDITIONAL PRIORITIZATION STEP FOR APPLICATIONS THAT RESULT MOST PROMISING ON THE BASIS OF SIMPLER PRIORITIZATION CRITERIA.

1.1.3.2.3. Translation

FROM *TRANSLATION SUB-COMMITTEE PRESENTATION FROM MARCH 2004 MEETING*:

OVERLAP WITH OTHER SECTORS:

- SPEECH

- TRANSLATORS COULD BE USERS OF SPEECH RECOGNITION
- MT + SPEECH REC/SYN = AUTOMATIC INTERPRETATION?
- CONTENT MANAGEMENT
 - INTEGRATION OF CMS WITH TRANSLATION WORKFLOW SYSTEM (E.G. FOR MULTILINGUAL WEB LOCALIZATION)
- TRAINING
 - TOOLS AND METHODS USED IN LANGUAGE TRAINING COULD ALSO BE OF INTEREST IN TRANSLATOR TRAINING

COMMENT: THESE BRIEF NOTES SUGGEST POSSIBLE SCENARIOS, WHOSE MERITS COULD BE FURTHER ASSESSED, AS PREVIOUSLY DISCUSSED, BY PROVIDING A MATRIX SHOWING IN FURTHER DETAILS THE MUTUAL DEPENDENCIES BETWEEN APPLICATIONS AND TECHNOLOGIES.

1.1.3.3. *COMMERCIAL PERSPECTIVE*

1.1.3.3.1. Speech Processing²⁸

TECHNOLOGY PRIORITY FROM A COMMERCIAL PERSPECTIVE:

1. APPLICATIONS – GOVERNMENT ADOPTION. PROMOTION & COLLABORATION
2. SPEECH RECOGNITION SERVICES AND PLATFORMS – PROMOTION & COLLABORATION
3. AUTOMATIC SPEECH RECOGNITION - RESEARCH & COMMERCIALIZATION
4. TEXT-TO-SPEECH
5. VOICE BIOMETRICS

²⁸ THIS SECTION IS DRAWN FROM THE DOCUMENT *CANADIAN SPEECH PROCESSING INDUSTRY: TECHNOLOGY ROADMAP*, VERSION 1.1 (2004), PRODUCED BY THE SPEECH PROCESSING SUB-COMMITTEE, SECTION 8.2.

1.2. RECOMMENDED TECHNOLOGIES

THE TASK OF RECOMMENDING TECHNOLOGIES IS THUS DESCRIBES BY INDUSTRY CANADA:

AT THIS POINT, PARTICIPANTS MUST SELECT THE BEST TECHNOLOGY ALTERNATIVES TO PURSUE, BASED ON AN EVALUATION OF THEIR COST, TIME LINES, PERFORMANCE, AND OTHER FACTORS. ONE PATH MAY GET THE INDUSTRY TO ITS DESTINATION FASTER, ANOTHER MIGHT BE CHEAPER, AND YET ANOTHER LESS RISKY (BECAUSE THERE ARE FEWER R&D ISSUES). ONE OPTION MIGHT LEAD TO A STEEPER INCREASE IN PERFORMANCE BUT AT THE COST OF A LONGER DEVELOPMENT TIME. THE PARTICIPANTS MUST WEIGH THE TRADE-OFFS AND ENSURE THAT THE TECHNOLOGY ALTERNATIVES SELECTED ARE INDEED ON THE CRITICAL PATH THAT LEADS TO THE DESIRED END PRODUCT OR ENABLING TECHNOLOGY.

IT IS IMPERATIVE TO WIN THE RACE TO MARKET. THUS, A CRITICAL TRADE-OFF IS THAT BETWEEN LONGER DEVELOPMENT TIMES WITH GREATER PERFORMANCE GAINS, AND RAPID TIME-TO-MARKET. IN ONE CASE, A 20 PERCENT IMPROVEMENT OVER THE BASE PERFORMANCE TARGET MAY BE WORTH THE EXTRA TIME OR COST, WHILE IN ANOTHER, EVEN A DOUBLING OF PERFORMANCE DOES NOT COMPENSATE FOR THE DELAYS IN GETTING THE PRODUCT INTO THE MARKET. IN THE LATTER INSTANCE, INTRODUCING THE PRODUCT AS EARLY AS POSSIBLE, AS IS SO OFTEN THE CASE, IS THE OVERRIDING CONSTRAINT.

TO FURTHER COMPLICATE MATTERS, A PARTICULAR TECHNOLOGY MAY HELP THE INDUSTRY MEET THE FIRST ONE OR TWO TARGETS FOR A DRIVER BUT CANNOT SATISFY LATER TARGETS—OR VICE VERSA, THE TECHNOLOGY FAILS TO SATISFY IMMEDIATE IMPERATIVES BUT ADDRESSES OBJECTIVES DOWN THE ROAD. THE LATTER IS A DISRUPTIVE TECHNOLOGY. A DISRUPTIVE TECHNOLOGY CANNOT SATISFY IMMEDIATE NEEDS, AND SO OFTEN IS IGNORED IN FAVOUR OF THE CURRENT TECHNOLOGY. HOWEVER, THE DISRUPTIVE TECHNOLOGY'S POTENTIAL PERFORMANCE AND RATE OF IMPROVEMENT, IF IT IS DEVELOPED, IS MUCH GREATER THAN THAT OF THE CURRENT TECHNOLOGY. WITHOUT THE BROADER PERSPECTIVE PROVIDED BY A TECHNOLOGY ROADMAP, THE DISRUPTIVE TECHNOLOGY OFTEN IS UNDER FUNDED OR IGNORED.

THE ROADMAPPING PARTICIPANTS MUST DETERMINE THE OPTIMAL TRADE-OFFS. SOMETIMES, THERE MAY BE ANALYTICAL OR MODELING TOOLS TO HELP JUDGE WHICH TECHNOLOGY ALTERNATIVES TO PURSUE OR THE CORRECT TIMING FOR THE SHIFT FROM ONE TECHNOLOGY TO ANOTHER.

THE ROADMAPPING PROCESS, AT EITHER THE CORPORATE OR THE INDUSTRY LEVEL, CONSOLIDATES THE BEST INFORMATION AND DEVELOPS A CONSENSUS AMONG MANY EXPERTS. IT BEGINS A COLLABORATIVE EFFORT THAT, WHEN CARRIED FORWARD INTO IMPLEMENTATION, RESULTS IN MORE EFFECTIVE AND EFFICIENT USE OF LIMITED TECHNOLOGY-INVESTMENT RESOURCES.²⁹

IN DISCUSSING EVALUATION DATA, IT WAS SUGGESTED THAT, RATHER THAN BEING USED TO GENERATE PRIORITIZATION DECISIONS, SUCH DATA COULD BE MORE MODESTLY USED TO JUSTIFY PRIORITIZATION DECISIONS. IN THIS VEIN, THE REST OF THIS SECTION IS DEVOTED TO DESCRIBING FEW PROJECT PROPOSALS THAT WERE PUT FORWARD DURING THE ROADMAPPING PROCESS, AND—TO THE EXTENT THAT THE PROJECT DESCRIPTION IS SUFFICIENTLY DETAILED—TO ATTEMPT

²⁹ *PRODUCING A TECHNOLOGY ROADMAP* (ACCESSED ON OCT. 31, 2005 AT [HTTP://STRATEGIS.IC.GC.CA/EPIC/INTERNET/INTRM-CRT.NSF/EN/RM00060E.HTML](http://strategis.ic.gc.ca/epic/internet/intrm-crt.nsf/en/rm00060e.html), SECTION 2, *DEVELOPMENT OF THE TECHNOLOGY ROADMAP*, SUBSECTION *RECOMMEND TECHNOLOGY ALTERNATIVES THAT SHOULD BE PURSUED*).

MAPPING THE PROJECT SPECIFICATIONS ONTO THE EVALUATION DATA PROVIDED ABOVE, IN ORDER TO TEST THE PROJECT ADEQUACY IN TERMS OF THE CRITICAL ATTRIBUTES PREVIOUSLY IDENTIFIED. THE GOAL OF THIS EXERCISE IS TO SUGGEST WAYS IN WHICH FURTHER PROPOSALS COULD BE COMPARED AND PRIORITIZED, AND, CONVERSELY, TO POINT OUT WAYS IN WHICH THE EVALUATION DATA COULD BE EXTENDED IN ORDER TO BE ADEQUATELY USED AS A TEST BED FOR PROJECT PROPOSALS.

1.2.1. Content Management

1.2.1.1. *BUILDING A MULTILINGUAL WORDNET*³⁰

PROJECT DESCRIPTION: DICTIONARIES, LEXICONS AND OTHER LANGUAGE RESOURCES EXIST IN ALL MAJOR LANGUAGES. HOWEVER, SOME CRITICAL TOOLS DO NOT EXIST IN ALL LANGUAGES AND WHEN THEY EXIST, THEY'RE NOT NECESSARILY EASY TO ACCESS, OFTEN BECAUSE OF THEIR PROHIBITIVE PRICE.

FOR EXAMPLE, *WORDNET*, AN ENGLISH-LANGUAGE KNOWLEDGE BASE CREATED AT PRINCETON UNIVERSITY, IS A LANGUAGE RESOURCE WHOSE EQUIVALENT IS NOT FOUND IN ALL MAJOR LANGUAGES. THOUGH *WORDNET* IS NOT PERFECT, IT IS HIGHLY ACCESSIBLE (I.E. FREE) AND USEFUL TO RESEARCHERS AND FIRMS WORKING ON THE DEVELOPMENT OF ENGLISH CONTENT MANAGEMENT TECHNOLOGIES. IT'S ESTIMATED THAT APPROXIMATELY \$ 3 MILLIONS HAVE BEEN INVESTED TO CREATE *WORDNET* AND IMPROVE IT SINCE 1985.

WORDNET IS A [SEMANTIC LEXICON](#) FOR THE [ENGLISH LANGUAGE](#). IT GROUPS ENGLISH WORDS INTO SETS OF SYNONYMS CALLED *SYNSETS*, PROVIDES SHORT DEFINITIONS, AND RECORDS THE VARIOUS [SEMANTIC](#) RELATIONS BETWEEN THESE [SYNONYM](#) SETS. THE PURPOSE IS TWOFOLD: TO PRODUCE A COMBINATION OF [DICTIONARY](#) AND [THESAURUS](#) THAT IS MORE INTUITIVELY USABLE, AND TO SUPPORT AUTOMATIC TEXT ANALYSIS AND [ARTIFICIAL INTELLIGENCE](#) APPLICATIONS. THE DATABASE AND SOFTWARE TOOLS HAVE BEEN RELEASED UNDER [AN OPEN SOURCE] STYLE LICENSE AND CAN BE DOWNLOADED AND USED FREELY. THE [DATABASE](#) CAN ALSO BE BROWSED [ONLINE](#).³¹

THE ABSENCE OF A REAL, FREE FRENCH, SPANISH OR KOREAN *WORDNET* MEANS THAT IT IS MORE DIFFICULT FOR PEOPLE AND FIRMS TO PRODUCE MORE POWERFUL CONTENT MANAGEMENT SOFTWARE IN THESE LANGUAGES³².

GIVEN CANADA'S BILINGUAL CHARACTER AND THE IMPORTANCE IT GIVES TO THE CONCEPT OF LINGUISTIC DIVERSITY, IT WOULD BE PARTICULARLY INTERESTING THAT CANADA LAUNCH A MAJOR INITIATIVE TO BUILD AN EASILY ACCESSIBLE MULTILINGUAL *WORDNET*.

ONE INTERESTING STRATEGY TO BUILD A MULTILINGUAL *WORDNET* WOULD CONSIST IN USING THE "COMMONS-BASED PEER PRODUCTION" APPROACH THAT HAS HELPED ENSURE THE SUCCESS OF INITIATIVES SUCH AS WIKIPEDIA OR OPEN DIRECTORY. ACCORDING TO THAT APPROACH, EXPERTS AND, POSSIBLY, NON-EXPERTS FROM CANADA AND ELSEWHERE COULD ADD KNOWLEDGE TO THE MULTILINGUAL RESOURCE. THIS STRATEGY HAS BEEN USED CONCLUSIVELY TO PRODUCE OTHER

³⁰ SEE THE DOCUMENT *PRESENTATION OF TWO PROJECTS OF INTEREST FOR ALL COMMITTEES*, PREPARED BY THE CONTENT MANAGEMENT SUB-COMMITTEE.

³¹ SOURCE: WIKIPEDIA.

³² A EU PROJECT, EUROWORDNET, WAS UNDERWAY BETWEEN 1996 AND 1999. THE RESOURCES PRODUCED DURING THE PROJECT DO NOT SEEM TO EQUAL THOSE CREATED AT PRINCETON IN QUANTITY AND QUALITY. THEY ARE NOT FREELY ACCESSIBLE EITHER.

TYPES OF LANGUAGE RESOURCES. FOR EXAMPLE,

IN ORDER TO ENABLE APPLICATIONS CLOSE TO HUMAN-LEVEL PERFORMANCE, COMPUTERS NEED LARGE AMOUNTS OF ANNOTATED TEXTS, WHICH OFTENTIMES REPRESENTS A BOTTLENECK IN DEVELOPING SUCH TECHNOLOGIES. THERE ARE ONLY A FEW ENGLISH-ROMANIAN PARALLEL TEXTS. AND STILL, THERE ARE 23 MILLION SPEAKERS OF ROMANIAN. IF ONLY 1% OF THEM ARE ALSO ENGLISH SPEAKERS, AND IF 1% OF THESE BILINGUAL SPEAKERS WOULD CONTRIBUTE SOME TEN TRANSLATED SENTENCES, WE WOULD ALREADY HAVE A FAIRLY DECENT-SIZED BILINGUAL CORPUS THAT COULD BE USED TO TEACH COMPUTERS HOW TO TRANSLATE BETWEEN THESE TWO LANGUAGES. THE *TEACH-COMPUTERS* PROJECT IS DESIGNED TO CONTRIBUTE TO SOLVING THIS PROBLEM THROUGH DEPLOYING KNOWLEDGE CAPTURE SYSTEMS OVER THE WEB TO TAP INTO PEOPLE’S ABILITY TO DEAL WITH LANGUAGE, AND THUS PRODUCE THE DATA SO CRITICALLY NEEDED TO BUILD HIGH-PERFORMANCE NLP TOOLS.³³

FEDERAL ORGANIZATIONS LIKE CANADIAN HERITAGE ALREADY KNOW ABOUT THIS STRATEGY AND MIGHT BE INTERESTED TO ACT AS PARTNERS IN PROJECT CALLS AIMING AT BUILDING A REAL MULTILINGUAL *WORDNET*.

THE CREATION OF A FREELY ACCESSIBLE MULTILINGUAL *WORDNET* WOULD BENEFIT THE RESEARCHERS AND FIRMS ACTIVE IN CONTENT MANAGEMENT, SPEECH, TRANSLATION AND TRAINING. INDEED, RESOURCES LIKE *WORDNET* WOULD HELP BUILD MORE POWERFUL CONTENT MANAGEMENT SYSTEMS, MAKE SPEECH PROCESSING TOOLS MORE INTELLIGENT, IMPROVE AUTOMATIC AND SEMI-AUTOMATIC TRANSLATION AND DEVELOP BETTER LANGUAGE TRAINING SOFTWARE (E.G. WRITING AIDS FOR STUDENTS OF A NEW LANGUAGE).

COMMENT: THE PROPOSED PROJECT ENTIRELY FALLS WITHIN THE *RESOURCES* CATEGORY. THE FOLLOWING ENTRIES FROM THE EVALUATION TABLE SEEM TO BE MORE OR LESS DIRECTLY RELEVANT TO THE PROPOSED PROJECT:

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	TIME TO MARKET	NATIONAL MARKET	INTERNATIONAL MARKET	EASE OF USE	EASE OF INTEGRATION	MODEL DEVELOPMENT	GRAMMAR DEVELOPMENT	DEVELOPMENT COST	ENHANCEMENTS	END-USER RETURN ON INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	CROSS-OVER	APPLICABILITY TO LANGUAGE TRAINING	APPLICABILITY TO TRANSLATION	APPLICABILITY TO SPEECH PROCESSING	APPLICABILITY TO CONTENT MANAGEMENT	APPLICATIONS & TOOLS	EXISTING STRENGTHS	LANGUAGE TRAINING SPECIFICITY	REVENUE MODEL	MATURITY
8	CM	RES.	MULTILINGUAL TERMINOLOGIES	2007	1	1	N/A	N/A	N/A	N/A	2	N/A	2	2	4	4	N/A	N/A	N/A	N/A	N/A	3	N/A	N/A	N/A
9	CM	RES.	ONTOLOGIES	2013	1	1	N/A	N/A	N/A	N/A	2	N/A	2	2	4	4	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
12	CM	TOOL	ONTOLOGY ACQ./MAINT.	2008	1	1	N/A	N/A	N/A	N/A	2	N/A	2	2	4	4	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
13	CM	TOOL	TERMINOLOGY ACQ./MAINT.	2008	1	1	N/A	N/A	N/A	N/A	3	N/A	2	2	4	4	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A

AN APPARENT STRENGTH OF THE PROJECT IS ITS HIGH CROSS-OVER VALUE, AS THE PROJECT WOULD

³³ SEE, AMONG OTHERS: TIMOTHY CHKLOVSKI & RADA MIHALCEA, “TEACHING COMPUTERS, BUILDING MULTILINGUAL LINGUISTIC RESOURCES WITH VOLUNTEER CONTRIBUTIONS OVER THE WEB,” *THE GLOBALIZATION INSIDER* (SEPTEMBER 14, 2004), AVAILABLE AT [HTTP://WWW.LISA.ORG/ARCHIVE_DOMAIN/NEWSLETTERS/2004/3.3/MIHALCEACHKLOVSKI.HTML](http://www.lisa.org/archive_domain/newsletters/2004/3.3/mihalceachklovski.html).

BE RELEVANT TO ALL SUB-SECTORS. THE PROJECT DOES NOT SEEM TO BE EQUALLY STRONG IN TERMS OF ITS ECONOMIC IMPACT. HOWEVER, THE ECONOMIC IMPACT OF A RESOURCE WOULD BE BEST ASSESSED IN THE CONTEXT OF THE CLUSTER OF TECHNOLOGIES AND APPLICATIONS THAT WOULD BENEFIT FROM THAT RESOURCE. THEREFORE IT COULD BE SUGGESTED THAT A FULLER EVALUATION OF THIS PROJECT COULD BE UNDERTAKEN IF PRIORITIZATION WAS DONE IN TERMS OF SCENARIOS WHERE SOFTWARE ITEMS ARE EVALUATED IN CLUSTERS, RATHER THAN IN ISOLATION.

1.2.1.2. *CROSSLINGUAL VOICE-DRIVEN HELP DESK*

PROJECT DESCRIPTION: HELP DESKS ARE RESOURCES THAT PROVIDE INFORMATION AND ASSISTANCE TO CLIENTS OR INTERNAL STAFF EXPERIENCING PROBLEMS WITH A PRODUCT OR SERVICE. THAT INFORMATION AND ASSISTANCE ARE PROVIDED ORALLY OR IN WRITING, VIA THE PHONE OR THE INTERNET.

AS REPORTED IN *WIKIPEDIA*, A HELP DESK CAN HAVE MANY LEVELS. “TYPICALLY THE FIRST-LEVEL HELP DESKS ARE PREPARED TO ANSWER THE MOST-COMMONLY-ASKED QUESTIONS. LIKE: —’WHY WON’T MY PRINTER WORK?’ —’WELL, IS IT TURNED ON?’ —’OOPS, NO. THANKS!’ OR —’THE NETWORK DOESN’T WORK?’ —’DID YOU CHECK THE CABLE?’ —’OH!, OK!’³⁴ THE SECOND OR HIGHER LEVELS HANDLE MORE DIFFICULT CALLS.

HELP AT THE FIRST LEVEL CAN COME FROM NON-SPECIALISTS WHO, WITH THE HELP OF Q&A (QUESTIONS AND ANSWERS) DATABASES AND APPLICATIONS, ARE ABLE TO ASSIST THE CALLER OR INTERNET USER. INCREASINGLY, IT CAN ALSO COME FROM CONTENT MANAGEMENT SOFTWARE. IN SOME CASES, CM SOFTWARE WILL PERMIT THE FAST RESOLUTION OF THE PROBLEM WITHOUT ANY HUMAN INTERVENTION. IN OTHERS, THE APPLICATION WON’T BE ABLE TO SOLVE THE PROBLEM ALONE AND WILL PASS IT TO A HUMAN ASSISTANT.

ORGANIZATIONS CAN SAVE A LOT BY USING THE NET INSTEAD OF THE PHONE TO HELP CUSTOMERS. INDEED IT’S ESTIMATED THAT, ON AVERAGE, IT COSTS \$US 32 TO SOLVE A PROBLEM BY PHONE, \$US 9 BY EMAIL, \$US 7 VIA INTERNET CHAT AND \$US VIA A WEB SITE. IT’S ALSO ESTIMATED THAT FIRMS CAN SAVE 25% AND MORE ON EACH CALL OR EMAIL BY AUTOMATING OR SEMI-AUTOMATING THEIR INTERACTION WITH CUSTOMERS WHO CALL OR WRITE (FOR EXAMPLE, BY USING VOICE RECOGNITION TO CAPTURE THEIR QUESTIONS AND VOICE SYNTHESIS TO PRODUCE THE ANSWERS)³⁵.

EVEN MORE, AUTOMATION CAN HELP FIRMS GET NEW INSIGHTS AND IDEAS. FOR EXAMPLE, USING TEXT MINING TOOLS TO ANALYZE THE CONTENT OF CUSTOMERS’ CALLS OR EMAILS CAN HELP COMPANIES IMPROVE THEIR SERVICES, DETECT PRODUCT ANOMALIES SOONER, AND SO ON.

THEORETICALLY CONTENT MANAGEMENT APPLICATIONS COULD ALSO HELP IMPROVE THE QUALITY OF SERVICE OFFERED BY TRANSNATIONAL COMPANIES TO THEIR CLIENTELES. FOR EXAMPLE, THEY COULD MAKE IT POSSIBLE FOR A CALLER TO ASK A QUESTION IN FRENCH; THE QUESTION COULD BE TURNED INTO TEXT AUTOMATICALLY BY TEXT-TO-SPEECH SOFTWARE OR THE REP COULD TYPE IT IN FRENCH INTO THE Q&A DATABASE; THE QUESTION COULD BE MATCHED AUTOMATICALLY TO ANSWERS WRITTEN IN FRENCH, IN ENGLISH OR IN SOME OTHER LANGUAGE IN THE DATABASE; FINALLY, IN NEED BE, THE SOLUTION COULD BE TRANSLATED IN FRENCH BY THE REP OR IT COULD BE TRANSLATED AUTOMATICALLY BY THE SYSTEM AND READ (POSSIBLY THROUGH VOICE

³⁴ SEE [HTTP://EN.WIKIPEDIA.ORG/WIKI/HELP_DESK](http://en.wikipedia.org/wiki/Help_desk).

³⁵ SEE [HTTP://WWW.NEXTSLM.ORG/HILES2.SHTML](http://www.nextslm.org/hiles2.shtml).

SYNTHESIS) TO THE CUSTOMER.

THIS LEADS US TO PROPOSE THAT AILIA LAUNCH A PROJECT TO PRODUCE A CROSSLINGUAL VOICE-DRIVEN HELP DESK PROTOTYPE. BUILDING THAT PROTOTYPE WOULD NEED THE ACTIVE PARTICIPATION OF RESEARCHERS AND FIRMS COMING FROM THREE OF THE FOUR SUBSECTORS: CONTENT MANAGEMENT, SPEECH AND TRANSLATION. THE PROTOTYPE COULD BE USED TO AUTOMATICALLY ANSWER A SERIES OF SIMPLE REPETITIVE CUSTOMER QUESTIONS IN ENGLISH, FRENCH AND SPANISH:

- EACH CALLER WOULD USE HIS NATIVE TONGUE TO ASK TROUBLESHOOTING QUESTIONS IN HIS OWN LANGUAGE.
- THE SYSTEM'S VOICE RECOGNITION MODULE WOULD ANALYZE THE ACOUSTIC SIGNAL AND TURN IT INTO TEXT.
- A CONTENT MANAGEMENT MODULE WOULD PRODUCE A CORRECT TEXTUAL VERSION OF THE QUESTION AND SEARCH POSSIBLE ANSWERS IN THE Q&A DATABASE.
- THE SYSTEM'S TRANSLATION MODULE WOULD TRANSLATE THE QUESTION SO THAT ANY BEST-ANSWER STORED IN A DIFFERENT LANGUAGE IS NOT MISSED.
- THE BEST ANSWER WOULD BE PRESENTED TO THE CALLER, IN HIS OWN LANGUAGE, THROUGH VOICE SYNTHESIS (THAT MAY REQUIRE THE TRANSLATION MODULE TO AUTOMATICALLY TRANSLATE THE QUESTION).
- THE CALLER COULD ASK A NEW QUESTION UNTIL HIS PROBLEM IS SOLVED OR THE SYSTEM FORWARDS IT TO A HUMAN REPRESENTATIVE.

THE SYSTEM COULD ALSO BE ABLE TO ANALYZE THE USER'S LEVEL OF FRUSTRATION, SO THAT VERY FRUSTRATED CALLERS COULD BE TAKEN CARE OF BY HUMAN OPERATORS AS SOON AS THE TRANSACTION BEGINS.

COMMENT: THE FOLLOWING IS THE SET OF APPLICATIONS TARGETED BY THE CONTENT MANAGEMENT SUB-SECTOR. THEY ALL SEEM TO BE STRONG IN TERMS OF MARKET OPPORTUNITIES. HOWEVER, THE PROPOSED PROJECT DOES NOT ENTIRELY FALL IN ANY OF THE LISTED APPLICATIONS, ALTHOUGH IT CERTAINLY HAS COMMONALITIES WITH SOME OF THEM, SUCH AS DIALOGUE AND MULTILINGUAL Q&A. THEREFORE, ONLY A PARTIAL ASSESSMENT OF THE ECONOMIC IMPACT OF THE PROPOSED PROJECT CAN BE GATHERED FROM THE EVALUATION TABLE.

PROGR. ID	SUBSECTOR	TYPE OF SOFTWARE	SOFTWARE	TIME TO MARKET	NATIONAL MARKET	INTERNATIONAL MARKET	EASE OF USE	EASE OF INTEGRATION	MODEL DEVELOPMENT	GRAMMAR DEVELOPMENT	DEVELOPMENT COST	ENHANCEMENTS	END-USER RETURN ON INVESTMENT	STANDARDS COMPLIANCE	LIFETIME	CROSS-OVER	APPLICABILITY TO LANGUAGE TRAINING	APPLICABILITY TO TRANSLATION	APPLICABILITY TO SPEECH PROCESSING	APPLICABILITY TO CONTENT MANAGEMENT	APPLICATIONS & TOOLS	EXISTING STRENGTHS	LANGUAGE TRAINING SPECIFICITY	REVENUE MODEL	MATURITY
1	CM	APP.	CLIR	2008	3	3	N/A	N/A	N/A	N/A	1	N/A	3	2	3	2	N/A	N/A	N/A	N/A	N/A	1	N/A	N/A	N/A
2	CM	APP.	DIALOGUE	2010	4	4	N/A	N/A	N/A	N/A	1	N/A	3	2	3	2	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
3	CM	APP.	INTELLIGENT SPEECH-TO-TEXT	2014	4	4	N/A	N/A	N/A	N/A	1	N/A	3	2	3	2	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
4	CM	APP.	MULTILING. QA	2010	4	4	N/A	N/A	N/A	N/A	1	N/A	3	2	3	2	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
5	CM	APP.	UNSTRUC. IR	2008	4	4	N/A	N/A	N/A	N/A	1	N/A	3	2	3	2	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
6	CM	APP.	TEXT ANALYTICS	2008	4	4	N/A	N/A	N/A	N/A	1	N/A	3	2	3	1	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A
7	CM	APP.	TEXT GENERATOR	2012	4	4	N/A	N/A	N/A	N/A	1	N/A	3	2	3	3	N/A	N/A	N/A	N/A	N/A	1	N/A	N/A	N/A

THE PROJECT'S MULTILINGUAL DIMENSION AND ITS SPEECH PROCESSING COMPONENT CLEARLY GIVE A STRONG CROSS-OVER VALUE TO THE PROPOSAL, AS POINTED OUT IN THE PROJECT DESCRIPTION. AT THE SAME TIME, THE PROPOSAL HAS NO CROSS-OVER WITH LANGUAGE TRAINING. THIS IS ONE CASE IN WHICH A PRELIMINARY CONSENSUS AMONG SUB-COMMITTEES AS TO THE RESPECTIVE ROLES OF DIFFERENT SUB-SECTORS MIGHT HELP ASSESSING THE PRESENT PROPOSAL. THE CROSS-OVER VALUE OF THE PROPOSAL MIGHT RESULT WEAKENED OR STRENGTHENED DEPENDING ON WHETHER, FOR EXAMPLE, IT WAS AGREED TO PRIORITIZE LANGUAGE TRAINING AS A TECHNOLOGY RECEIVER OR NOT.

1.2.2. Speech Processing³⁶

1. APPLICATIONS – GOVERNMENT ADOPTION. PROMOTION & COLLABORATION
2. SPEECH RECOGNITION SERVICES AND PLATFORMS – PROMOTION & COLLABORATION
3. AUTOMATIC SPEECH RECOGNITION - RESEARCH & COMMERCIALIZATION
4. TEXT-TO-SPEECH
5. VOICE BIOMETRICS

1.2.3. Translation

1.2.3.1. REAL-TIME SPEECH-TO-SPEECH “TRANSLATION” WITHIN A LANGUAGE³⁷

PROJECT DESCRIPTION: ONE OF THE SCENARIOS FORESEEN FOR THIS PROJECT IS THAT OF TWO NON-NATIVE SPEAKERS CONVERSING IN ENGLISH. THE PROJECT INCLUDES ACCENT NEUTRALIZATION AND DIALECT NEUTRALIZATION, THUS RESEMBLING THE IDEA OF A “CONTROLLED LANGUAGE.” TWO POSITIVE BY-PRODUCTS OF THE PROPOSAL WOULD THAT TRANSLATION WOULD BE EASIER IN

³⁶ THIS SECTION IS DRAWN FROM THE DOCUMENT *CANADIAN SPEECH PROCESSING INDUSTRY: TECHNOLOGY ROADMAP, VERSION 1.1 (2004)*, PRODUCED BY THE SPEECH PROCESSING SUB-COMMITTEE, SECTION 8.3.

³⁷ SEE *OTTAWA MEETING FLIP CHART NOTES, AFTERNOON SESSION – GROUP 4 TRANSLATION, MARCH 23, 2004.*

THIS CONTEXT THAN IN OTHERS AND THAT APPLICATIONS TO LANGUAGE TRAINING COULD BE FORESEEN.

COMMENT: THIS IS A FURTHER EXAMPLE OF A PROPOSAL THAT CANNOT BE ENTIRELY EQUATED WITH ANY OF THE APPLICATIONS INCLUDED IN THE EVALUATION TABLE (SUCH AS SPEECH-TO-SPEECH TRANSLATION, MACHINE TRANSLATION, DIALOGUE SYSTEMS), THUS MAKING IT DIFFICULT TO ASSESS ITS STRENGTH IN THE LIGHT OF THE AVAILABLE DATA. BEING AT THE CROSSROAD OF DIFFERENT SECTORS, THE PROPOSAL IS ALSO A GOOD EXAMPLE OF AN APPLICATION WITH A STRONG CROSS-OVER. THE PROPOSAL MAY FIND AN APPLICATION IN LANGUAGE TRAINING, WHILE HAVING AT THE SAME TIME STRONG TECHNOLOGICAL COMPONENTS FROM ALL THE OTHER THREE SECTORS (SPEECH RECOGNITION AND SYNTHESIS, NATURAL LANGUAGE UNDERSTANDING AND GENERATION, ETC.). IT MIGHT BE CONJECTURED THAT, WHILE THE ECONOMIC IMPACT OF THE APPLICATION PER SE IS UNCLEAR, THIS UNCERTAINTY IS COUNTER-BALANCED BY THE FACT THAT THE PROPOSAL PROVIDES THE OPPORTUNITY TO DEVELOP TECHNOLOGIES WITH A WIDE RANGE OF APPLICATIONS, THUS AVOIDING COMMITTING TECHNOLOGY DEVELOPMENT TO A SINGLE TECHNOLOGICAL PATH.

1.3. IMPLEMENTATION PLAN AND BUDGET

PREPARED BY DR. FRED POPOWICH

PREPARED FOR THE LANGUAGE TECHNOLOGY RESEARCH CENTRE

THE CORE WORK OF THE TECHNOLOGY ROADMAP WAS COMPLETED IN MARCH OF 2005, WITH THE KEY RECOMMENDATIONS BEING PRESENTED TO ALL THE STAKEHOLDERS INVOLVED IN THE TECHNOLOGY ROADMAP PROCESS. FEEDBACK WAS RECEIVED FROM MEMBERS OF THE TECHNOLOGY ROADMAP COMMITTEE, WHICH RESULTED IN AN ACTION PLAN. THESE RECOMMENDATIONS AND ACTION PLAN ARE CONTAINED IN THE FINAL TRM REPORT, AND ARE INCLUDED AS APPENDIX A AND APPENDIX B IN THE CURRENT DOCUMENT. THE RECOMMENDATIONS CONTAINED IN APPENDIX A WERE ACCOMPANIED BY ORGANIZATIONS WHICH THE COMMITTEE THOUGHT SHOULD BE RESPONSIBLE FOR THE ACTIONS ON THE RECOMMENDATIONS. IN THE PERIOD SINCE APRIL 2005, AILIA, INDUSTRY CANADA, THE LTRC AND THE NRC HAVE ALL STARTED TAKING APPROPRIATE ACTION ON THESE RECOMMENDATIONS, AND HAVE STARTED TO EXECUTE ON THE ACTION PLAN CONTAINED IN APPENDIX B.

THE PLAN FOR MOVING FORWARD MUST INCLUDE THE INCORPORATION OF FEEDBACK FROM THE PUBLISHED TRM, AND CONTINUED ACTION UPON THE RECOMMENDATIONS AND ACTION PLAN CONTAINED IN APPENDIX A AND B. MOST IMPORTANTLY, IT MUST INCLUDE “BUY-IN” FROM LANGUAGE INDUSTRY COMPANIES WHO CAN WORK THROUGH THEIR INDUSTRY ASSOCIATION, AILIA, TO STRENGTHEN THE CANADIAN LANGUAGE INDUSTRY. INDUSTRY MEMBERS WILL NEED TO PLAY KEY ROLES IN THE CREATION OF CONSORTIA TO WORK ON STRATEGIC PROJECTS RESULTING FROM THE TRM AND THE TRM PROCESS.

THE CONTINUATION OF THE IMPLEMENTATION PROCESS FOR THE TRM WILL NEED TO INCLUDE THE FOLLOWING STEPS.

1. PUBLICATION OF THE FULL TRM, SOLICITATION OF FEEDBACK FROM INTERESTED PARTIES, AND ASSIMILATION OF THE RESULTS.

SINCE BOTH THE FRENCH AND ENGLISH VERSIONS OF THE TRM ARE DUE TO BE COMPLETED BY MARCH 31, 2006, IT SHOULD BE STRAIGHTFORWARD TO MAKE THIS INFORMATION AVAILABLE IN THE MEMBERS-ONLY AREA OF THE AILIA AND LTRC WEBSITES. THIS SHOULD BE FOLLOWED BY A GENERAL ANNOUNCEMENT TO THE AILIA AND LTRC MAILING LISTS. THE ASSIMILATION OF RESULTS, SINCE IT IS A TECHNOLOGY RELATED ACTIVITY, WOULD BE APPROPRIATE FOR THE LTRC AND/OR THE NRC TO UNDERTAKE. THE BUDGET FOR THIS SHOULD SUPPORT ABOUT FIVE MAN-DAYS OF EFFORT OVER ABOUT A TWO MONTH PERIOD. THIS ACTIVITY SHOULD IDEALLY BE COMPLETED BY THE END OF MAY 2006.

2. LAUNCHING OF LANGUAGE INDUSTRY PORTAL

IT IS MY UNDERSTANDING THAT AILIA/IC/LTRC ALREADY HAVE DETERMINED A BUDGET FOR THE LAUNCHING AND MAINTENANCE OF THE LANGUAGE INDUSTRY PORTAL. THIS PORTAL SHOULD BE LAUNCHED AS SOON AS POSSIBLE.

3. ACTIVITIES RELATED TO FUNDING OF RESEARCH, DEVELOPMENT AND PROJECTS

AILIA SHOULD CONTINUE ITS EFFORTS RELATING TO RECOMMENDATION 2 FROM APPENDIX A, BUT OTHER ORGANIZATIONS, INCLUDING THE LTRC AND COMPANIES THEMSELVES SHOULD TAKE AN ACTIVE ROLE TO FIND FINANCING FOR RESEARCH, DEVELOPMENT AND PROJECTS. THE RECENT AILIA FINANCING TRAINING SESSIONS, WHICH WE HELD ACROSS THE COUNTRY, HAS PROVIDED SOME INITIAL VISIBILITY. THE LTRC HAS ALSO BEEN STRIVING TO FIND FINANCIAL SUPPORT FOR PROJECTS. THE LANGUAGE INDUSTRY PORTAL CAN ALSO PLAY A ROLE IN ESTABLISHING RELATIONSHIPS WITH PRECARN, NSERC, NRC IRAP, VCS (SUCH AS BDC FUND) AND STRATEGIC INVESTORS. IT WOULD BE APPROPRIATE TO BUDGET AT LEAST ONE DAY PER WEEK TO PROVIDING CONTENT ON THE PORTAL FOR MARKETING INFORMATION TARGETED AT THESE ORGANIZATIONS.

4. ANNUAL ACTIVITIES

ONE OF THE RECOMMENDATIONS CALLED UPON INDUSTRY CANADA TO PROVIDE FUNDING TO SUPPORT COMPANIES AND ORGANIZATIONS TO ATTEND ANNUAL COMPETITIONS. AILIA, THE LTRC AND THE NRC SHOULD WORK CLOSELY WITH INDUSTRY CANADA TO ENSURE THAT APPROPRIATE ACTION IS TAKEN ON THIS RECOMMENDATION.

5. CONSORTIUM BUILDING

THE TRM DOCUMENT DESCRIBES A WIDE RANGE OF LANGUAGE TECHNOLOGY RESOURCES, TOOLS, APPLICATIONS AND SOLUTIONS, MANY OF WHICH COULD LEAD TO PROJECTS UNDERTAKEN BY COMPANIES, ORGANIZATIONS AND RESEARCH INSTITUTIONS. MOST IMPORTANTLY, THE DOCUMENT CONTAINS CRITERIA THAT MIGHT BE APPLIED TO DETERMINE THE FEASIBILITY OF THESE PROJECTS. OVER THE NEXT YEAR, IT IS NOT ONLY IMPORTANT TO FIND CHAMPIONS FOR THE PRIORITY PROJECTS, BUT ALSO TO ENSURE THAT THERE IS THE OPPORTUNITY TO MOVE FORWARD ON OTHER PROJECTS, WITH THE APPROPRIATE PLAYERS. AILIA, THE LTRC AND THE NRC MUST WORK TOGETHER TO DETERMINE HOW TO BEST USE THEIR RESOURCES TO FACILITATE THE CREATION OF LANGUAGE TECHNOLOGY PROJECTS. EACH ORGANIZATION SHOULD HAVE A BUDGET (AND

KEY PERSON) ASSOCIATED WITH THIS RESPONSIBILITY.

APPENDIX A – RECOMMENDATIONS

1. *CREATION OF LANGUAGE TECHNOLOGY WEB SITE AS PART OF PORTAL*

- ☑ THE CREATION OF A CLEARING HOUSE FOR RESEARCH IDEAS AND RESOURCES
- ☑ PROVIDE LANGUAGE TECHNOLOGY RESOURCE AND TOOLS INVENTORY AND DISTRIBUTION
 - ☑ CONSIDER **OPEN SOURCE** AND NOT JUST PROPRIETARY RESOURCES
- ☑ LIST OF TECHNOLOGY DEVELOPERS, PROVIDERS, AND RESEARCH COMING FROM UNIVERSITIES, CENTRES
 - ☑ CAPABILITIES FOR COMPANIES/ORGANIZATIONS TO ENTER THEIR OWN INFORMATION
- ☑ INVENTORY OF EXISTING STANDARDS/NORMS, THEIR MATURITY AND HOW THEY MIGHT BE APPLIED TO AN **SME**, INCLUDING THE FOLLOWING
 - ☑ RESOURCES
 - ☑ INTEROPERABILITY
 - ☑ INTERNATIONAL STANDARDS
 - ☑ SEMANTIC WEB (ONTOLOGIES)
 - ☑ SERVICES INFRASTRUCTURE
- ☑ DATA FROM SURVEYS
- ☑ MONITORING OF RELEVANT DATA
- ☑ TAKE INDIVIDUAL RECOMMENDATIONS FROM INDIVIDUAL REPORTS
- ☑ PROVIDE AN INTEGRATED REPORT

PARTIES RESPONSIBLE FOR ACTION:

- ☑ LTRC
- ☑ AILIA
- ☑ IC

2. *APPROACH PRECARN, NSERC, IC, NRC IRAP, VCS (SUCH AS BDC FUND) AND STRATEGIC INVESTORS TO FUND RESEARCH, DEVELOPMENT AND PROJECTS*

PARTIES RESPONSIBLE FOR ACTION:

- ☑ AILIA

3. *PROVIDE FUNDING TO SUPPORT COMPANIES AND ORGANIZATIONS TO ATTEND ANNUAL COMPETITIONS*

PARTIES RESPONSIBLE FOR ACTION:

- ☑ INDUSTRY CANADA

4. *BRING TOGETHER ALL STAKEHOLDERS (INDUSTRY, RESEARCH CENTRES, UNIVERSITIES, CUSTOMERS) TO WORK ON LANGUAGE TECHNOLOGY PROJECTS*

- ☑ SUPPORT COLLABORATIVE PRE-COMPETITIVE PROJECTS BETWEEN COMPANIES
 - ASSIST IN DEVELOPMENT OF PROPOSALS
 - BRING IN CONSULTANTS, STAKEHOLDERS
 - INITIAL MEETINGS
 - POSSIBLE BIG PROJECTS SPANNING MULTIPLE TECHNOLOGY AREAS:
 - **SUPPORT A STRATEGIC CANADIAN PROJECT CROSSING MULTIPLE SUBSECTORS (GALE) AS A BIG GOAL**
 - CANADIAN PARLIAMENTARY MATERIAL PROJECT
- ☑ SUPPORT COLLABORATIVE PROJECTS WITH NRC RESULTING IN IP AGREEMENTS THAT ARE APPROPRIATE FOR COMMERCIAL EXPLOITATION
- ☑ ANNUAL TECHNOLOGY WORKSHOP AND COMPETITION
- ☑ LANGUAGE TECHNOLOGY FAIR
- ☑ WEEKLY SEMINARS (LUNCH AND LEARN)

PARTIES RESPONSIBLE FOR ACTION:

- ☑ AILIA (PERHAPS ALSO AS A GOVERNING BODY FOR JOINT VENTURES)
- ☑ LTRC
- ☑ NRC

5. *AILIA SHOULD INTERACT AND LEARN FROM CORRESPONDING (SISTER) ORGANIZATIONS IN US AND EU*

PARTIES RESPONSIBLE FOR ACTION:

- ☑ AILIA

☑ LTRC

APPENDIX B – ACTION PLAN

INITIAL ACTIONS TO BE UNDERTAKEN BY THE FOLLOWING COMMITTEES. ADDITIONAL ACTIONS WILL BE REQUIRED TO DEAL WITH THE RECOMMENDATIONS.

1. STRATEGIC PROJECT COMMITTEE
 - ☑ CONSISTING OF CHAIRS OF THE CURRENT SUBCOMMITTEES, AND A REPRESENTATIVE FROM NRC AND LTRC
 - ☑ RESPONSIBLE FOR CANADIAN “GALE” INITIATIVE
 - ☑ PLAY A ROLE IN DETERMINING STRATEGIC PROJECTS BASED ON INFORMATION SO FAR ASSEMBLED FOR THE TRM
 - ☑ *RESPONSIBLE FOR ACTION ON RECOMMENDATION 4*
2. DISSEMINATION COMMITTEE
 - ☑ RESPONSIBLE FOR FINAL INTEGRATED REPORT
 - ☑ FINAL ARCHIVAL WEBSITE
 - ☑ TRANSLATION OF APPROPRIATE MATERIAL
 - ☑ COMMITTEE WILL WORK WITH INDUSTRY CANADA WHO WILL ENGAGE A CONSULTANT TO DO SOME OF THE ABOVE WORK
 - ☑ INTEGRATED IN THE PORTAL
 - ☑ *RESPONSIBLE FOR ACTION ON RECOMMENDATION 1*
3. ADVOCACY COMMITTEE
 - ☑ FORMED BY AILIA MEMBERS, AND A REPRESENTATIVE FROM NRC AND LTRC
 - ☑ *RESPONSIBLE FOR ACTION ON RECOMMENDATION 2*
 - ☑ DEALS WITH THE FOLLOWING ISSUES
 - ☑ FINANCING
 - ☑ STANDARDS
 - ☑ GOVERNMENT