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Closing the Gap

A Southern Maine Community College Report on Maine education and labor skills gaps and the economic impact of higher education

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A Southern Maine Community College Report on Maine education and labor skills gaps and the economic impact of higher education

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Closing the Gap

Table of Contents

Executive Summary

The purpose of this report is two-fold:

- to explain the effort Southern Maine Community College (SMCC) is making to meet its goal of creating "an entirely new model of higher education in Maine"[1] at its new Midcoast campus; and
- to guide that effort by identifying employment projections and skills gaps that would best orient the subject matter and delivery mechanisms for the new campus.

The report was prepared by Planning Decisions, Inc. (PDI), a public policy consultancy based in South Portland, Maine. It begins by examining the newest Department of Labor (DOL) projections of job growth for Maine and identifying 26,000 jobs in selected sectors that appear to present the greatest opportunity for growth in Maine. Using DOL occupational categories, the report translates the 26,000 industry-targeted jobs into the occupations those industries will actually require. Next, the report identifies the educational preparation required to fill these industry job growth targets and compares the target demand for workers to the rates of graduation from Maine institutions of higher education in these programs. With these demand and supply estimates, the report presents a summary of the most striking skills gaps and thus of the areas where SMCC can best concentrate its program development to help the state achieve its job growth target.

This analysis led to several important conclusions. The first is that, if the current supply-demand imbalance persists, Maine will suffer a severe shortage of workers in computer, information and related support services and in precision production occupations. If Maine does not reallocate education and training resources to address this existing and potentially growing labor supply gap, the state's economic prosperity will be threatened and the hopes for development of Brunswick Landing as a major industrial and research center will be severely threatened. A second, although less severe, skills gap exists in Transportation and Materials Moving occupations, Construction Trades, Personal and Culinary Services and Science Technologies and Technicians.

A second important point concerns Mathematics, Statistics and Engineering. Maine institutions of higher education now offer only bachelor's (or higher) degrees in these fields. At current graduation rates, Maine appears to be able to cover the number of graduates likely to be required in the targeted industries. However, because of their importance and the need to maintain clear pathways into these fields, SMCC should provide preparatory coursework in these fields as part of its offerings in pre-baccalaureate engineering technology fields as a way of facilitating movement of students in associate degree programs into these baccalaureate programs. This is particularly important for the pre-engineering curriculum being developed for the Midcoast campus.

A third important conclusion concerns Engineering Technologies and Technicians, Business Management and Health Professions. In all three, the current rate of graduates exceeds the target industry demand. This indicates a need to look carefully at the individual components of these fields to see where true excess supply may be building up and to consider ways to reorient these programs to meet urgent needs in other areas.

Having identified skills gaps that the SMCC Midcoast campus ought to address, the report suggests that they will best be addressed by designing a curriculum and educational delivery program that bridges the gap between employers and educators and embodies the following characteristics:

- It establishes a relatively narrow focus;
- It establishes an effective employer-educator collaborative process;
- It develops clearly articulated career pathways;
- It breaks educational/learning experiences into small components; and
- It establishes an ongoing, third party review process.

1 http://www.smccme.edu/about/campus-locations/midcoast-campus.html.

The report concludes by estimating the overall economic and fiscal impact on the state of Maine of succeeding—of building and operating the Midcoast campus and actually meeting the employment growth targets suggested here. Using the IMPLAN economic impact model for the State of Maine[1] indicates that building and successfully operating the Midcoast campus will:

- generate annual sales for Maine businesses of approximately $7.2 million as a result of the one-time investment in building the campus and of over $8.1 million on an annual basis as a result of ongoing operation of the campus at full operation;
- support employment in Maine of over 60 jobs related to one-time construction impacts and approximately 110 full-time equivalent jobs related to ongoing campus operations and their indirect impacts[2];
- provide income for Maine workers of $2.4 million from one-time construction impacts and over $6.4 million as a result of ongoing operations; and
- generate annual state and local tax and fee revenue of nearly $320,000 as a result of one-time construction impacts and over $850,000 from ongoing operational impacts.

An even more important measure of the campus's economic impact derives from its success. Every 1,000 new jobs distributed across the industry growth targets suggested in this report will, on an annual basis, generate:

- Total sales for Maine businesses of nearly $330 million;
- Total employment in Maine of nearly 2,100 jobs;
- Total income for Maine workers of over $100 million; and
- Total state and local tax and fee revenue of over $13 million.

Most importantly, these impacts will continue, year after year, as long as the 1,000 targeted jobs remain filled. In actual fact, each year, as workers grow more experienced and productive, these impacts should increase.

2 IMPLAN (IMpact Analysis for PLANing) is a computer based input-output modeling program originally developed by the U.S. Department of Agriculture Forest Service for resource management planning. It contains a mathematical representation of the purchasing patterns that take place between sectors of an economy. Built into the IMPLAN data files are all of the industry sales, employment and income data for each sector of the Maine economy. IMPLAN uses these data along with national purchasing patterns (national input-output matrices) to create regional models. Further information is available at http://implan.com/V4/Index.php.

3 Many on campus instructional jobs will be composed of part-time and/or short term, course specific instructors, so the actual number of people employed as a result of campus operations will be considerably larger than 110.

Introduction

In June 2010, Maine voters approved a $23.75 million bond to create jobs and promote economic development. Of that amount, $4.75 million was allocated to Southern Maine Community College (SMCC) to develop a new campus at the former Brunswick Naval Air Station. The challenge presented to SMCC by its Midcoast campus is extraordinary—"be an entirely new model of higher education in Maine."[3] To meet this challenge SMCC undertook an effort to:

- Identify those industries most likely to grow in Maine over the next decade, particularly those targeted by the Midcoast Regional Redevelopment Authority (MRRA) for the Brunswick Landing Research and Development Center it is developing at the former naval air station;
- Translate these industrial development job targets into occupational job targets;
- Identify gaps in its current educational offerings, i.e., those areas where the growth of demand for skilled workers exceeds the growth of supply of qualified trainees and graduates;
- Design, equip and organize an educational curriculum and delivery system that brings educators, employers and employees (both current and potential) into an effective partnership committed to filling the skills gaps and thus achieving job growth targets.

The purpose of this report is to explain this effort and present its results. In addition, the report concludes by estimating the overall economic and fiscal impact on the state of Maine of succeeding—of actually meeting the employment growth targets suggested here.

4 http://www.smccme.edu/about/campus-locations/midcoast-campus.html.

Identify Target Growth Industries

The Midcoast Regional Redevelopment Authority (MRRA) will soon complete its acquisition of the former Brunswick Naval Air Station. This facility has over two million square feet of commercial and industrial space, a world-class aviation complex and 1,000 acres of open space. MRRA intends to develop the facility as an industrial-research-education complex focused on aviation, renewable energy research and high-skill, high-growth manufacturing.[4] SMCC's Midcoast campus will be designed to serve that mission by supporting the training needs of businesses that are now or could be located in the Greater Metropolitan Portland region, especially those seeking to locate at the former naval air station, now called Brunswick Landing.

It is important to note in this regard that while the Midcoast Campus is located in Brunswick, it need not restrict its scope of service solely to businesses now located in the Midcoast area. As has been regularly documented, most recently in the State of Metropolitan America report by the Brookings Institution, the Greater Portland Metro area is home to far greater proportion of the state's jobs and earnings than of its population.[5] Greater Portland is the economic engine for the state as a whole, creating jobs for workers who commute from literally all over the state. In short, SMCC must include in its investigation any industry with a reasonable prospect for growth in Maine, even (or perhaps particularly) if it does not now have a sizeable presence in the state. The most recent industry and occupational projections published by the U.S. Department of Labor are for the 2008 to 2018 period.[6] The first step in utilizing these data to guide the formation of an educational program at the SMCC Midcoast campus is to examine the Maine and national employment projections for industries that are now in or could be attracted to the area. Table 1 below lists the industry projections published by the DOL for manufacturing.

5. http://www.mrra.us/home.html
6. http://www.brookings.edu/metro/StateOfMetroAmerica/Profile.aspx?fips=38860#/?fips=38860&viewfips=38860&subject=7&ind=70&year=2009&geo=metro
7. _http://www.bls.gov/emp/#tables.

Table 1 Employment Projections for Manufacturing, Maine & U.S., 2008 to 2018

Industry	NAICS*	Average Number of Employees, Maine		Employment Change, Maine		U.S.	Notes
		2008	2018	Net	Percent	Percent	
Total Employment	n.a.	675,743	690,130	14,387	2.1%	10.1%	
Chemical mfg.	325	1,986	2,341	355	17.9%	-6.7%	pharmaceuticals
Fabricated metal product mfg.	332	5,671	5,859	188	3.3%	-8.5%	
Miscellaneous mfg.	339	2,005	2,132	127	6.3%	20.3%	medical equip. & supplies
Plastics and rubber products mfg.	326	2,669	2,793	124	4.6%	-7.7%	
Beverage and tobacco product mfg.	312	1,230	1,309	79	6.4%	-9.1%	craft brewing & distilling
Machinery mfg.	333	2,193	2,241	48	2.2%	-7.6%	
Petroleum and coal products mfg.	324	360	385	25	6.9%	-22.5%	asphalt
Computer and electronic product mfg.	334	3,147	3,125	-22	-0.7%	-19.3%	
Primary metal mfg.	331	369	333	-36	-9.8%	-9.9%	
Electrical equipment and appliance mfg.	335	614	563	-51	-8.3%	-13.5%	relevant to energy
Apparel mfg.	315	372	280	-92	-24.7%	-55.4%	
Textile product mills	314	1,034	930	-104	-10.1%	-38.1%	
Nonmetallic mineral product mfg.	327	1,382	1,273	-109	-7.9%	2.6%	cement
Printing and related support activities	323	2,209	2,009	-200	-9.1%	-16.0%	
Furniture and related product mfg.	337	1,405	1,200	-205	-14.6%	6.3%	
Food mfg.	311	5,856	5,447	-409	-7.0%	-0.1%	
Textile mills	313	1,422	874	-548	-38.5%	-47.6%	
Leather and allied product mfg.	316	2,033	1,469	-564	-27.7%	-31.5%	
Transportation equipment mfg.	336	9,300	8,323	-977	-10.5%	-10.5%	ship & boatbuilding, aeronautics
Wood product mfg.	321	5,188	3,742	-1,446	-27.9%	-7.7%	
Paper mfg.	322	8,310	6,504	-1,806	-21.7%	-24.3%	

North American Industrial Classification System (NAICS) is a way of categorizing businesses based on the primary product or service it sells
Source: US Department of Labor Employment Projections 2008-2018, Employment Projections Program, US Department of Labor, US Bureau of Labor Statistics

The sectors in Table 1 are ranked by absolute number of job growth over the 2008 to 2018 period, running from chemical manufacturing (in Maine's case primarily biotech and pharmaceutical companies) with a projected increase of 355 jobs to paper manufacturing with a projected decline of just over 1,800 jobs. The sectors listed in italics are those excluded from the high growth group whose training needs serve as SMCC's target market. The only sectors with negative job growth projections included in the high growth group are:

- Computer and electronic product manufacturing on the grounds that it is already such a large and important component of the Maine economy—over 3,000 jobs, many at National[7] and Fairchild Semiconductor—that continuing to train for replacement workers will be critical to maintenance of existing jobs;
- electrical equipment and appliance manufacturing because of its importance to the energy generation business which is a target sector in the plans for Brunswick Landing; and
- transportation equipment because of its importance to the boat, ship and aircraft building industries which are already strong at the Bath Iron Works and in the initial investments at Brunswick Landing.

8.. Recent news that Texas Instruments has initiated an effort to buy National Semiconductor simply reinforces Maine's need to convince its high-tech employers that it has an effective workforce training and development system.

Table 2 contains a similar presentation for high growth service industries. It includes four major categories—health care, leisure and entertainment, technology and transportation. The only sectors without high growth projections included here are utilities—included because of the state's current emphasis on renewable energy development, CMP's $1.3 billion commitment to transmission line development, Brunswick Landings' desire to develop as a center of energy research and the recently begun Three Ring Binder broadband internet expansion project—and truck transportation because of its importance as a complement to manufacturing development.

Table 2 Employment Projections for High Growth Services, Maine & U.S., 2008 to 2018

Industry	NAICS	Average Number of Employees, Maine		Employment Change, Maine		U.S.	Notes
		2008	2018	Net	Percent	Percent	
Hospitals	622	30,879	35,204	4,325	14.0%	11.9%	
Ambulatory health care services	621	25,944	29,013	3,069	11.8%	35.6%	
Accommodation & Food Service	72	51,800	54,142	2,342	4.5%	8.7%	
Professional, Scientific and Tech Services	541	24,436	26,132	1,696	6.9%	44.3%	
Administrative and support services	561	23,445	24,921	1,476	6.3%	19.3%	
Support activities for transportation	487	1,498	1,634	136	9.1%		
Construction	23	29,375	30,644	1,269	4.3%	18.5%	
ISPs, search portals, and data processing & Other Info Services	518	23,932	25,008	2,089	8.7%	47.3%	Re 3-Ring Binder project
Nursing and residential care facilities	623	22,919	23,995	1,076	4.7%	21.2%	
Other Information Services	519	940	1,006	66	7.0%		
Social assistance	624	18,425	19,442	1,017	5.5%	31.6%	
Arts, Entertainment & Recreation	71	8,235	8,737	502	6.1%	18.5%	
Scenic and sightseeing transportation & transport support services	486	1,659	2,002	617	37.2%	20.7%	
Motion picture and sound recording industries	512	1,385	1,728	343	24.8%	12.4%	
Transit and ground passenger transportation	484	1,432	1,566	134	9.4%	14.7%	
Waste management and remediation services	562	1,711	1,781	70	4.1%	25.2%	
Air transportation	481	336	396	60	17.9%	6.5%	Re Brunswick Landing target
Utilities	221	1,865	1,905	40	2.1%	-9.6%	re Brunswick Landing energy
Truck transportation	483	5,951	5,990	39	0.7%	10.6%	re all manufacturing

Source: US Department of Labor Employment Projections 2008-2018, Employment Projections Program, US Department of Labor, US Bureau of Labor Statistics

Table 3 combines Tables 1 and 2 into a master list of industrial sectors considered the key growth industries that the SMCC Midcoast campus should target for program development.

Table 3 Target Sectors for SMCC Midcoast Campus Program Development

Target Industries	NAICS	Average Number of Employees, Maine		Employment Change, Maine		U.S.	Target Growth
		2008	2018	Net	Percent	Percent	
Hospitals	622	30,879	35,204	4,325	14.0%	11.9%	4,500
Ambulatory health care services	621	25,944	29,013	3,069	11.8%	35.6%	3,200
Accommodation & Food Service	720	51,800	54,142	2,342	4.5%	8.7%	2,400
ISPs, search portals, data processing & Other Info	518	25,449	27,145	2,709	10.6%	47.3%	3,000
Professional, Scientific and Tech Services	541	24,436	26,132	1,696	6.9%	44.3%	2,000
Administrative and support services	561	23,445	24,921	1,476	6.3%	19.3%	1,500
Construction	230	29,375	30,644	1,269	4.3%	18.5%	1,500
Nursing and residential care facilities	623	22,919	23,995	1,076	4.7%	21.2%	1,200
Social assistance	624	18,425	19,442	1,017	5.5%	31.6%	1,200
Scenic and sightseeing transportation & transport	487	8,509	9,011	776	9.1%	20.7%	700
Arts, Entertainment & Recreation	710	8,235	8,737	502	6.1%	18.5%	500
Chemical manufacturing	325	1,986	2,341	355	17.9%	-6.7%	500
Motion picture and sound recording industries	512	1,385	1,728	343	24.8%	12.4%	500
Fabricated metal product manufacturing	332	5,671	5,859	188	3.3%	-8.5%	400
Transit and ground passenger transportation	485	1,432	1,566	134	9.4%	14.7%	150
Miscellaneous manufacturing	339	2,005	2,132	127	6.3%	20.3%	250
Plastics and rubber products manufacturing	326	2,669	2,793	124	4.6%	-7.7%	250
Beverage manufacturing	312	1,230	1,309	79	6.4%	-9.1%	100
Waste management and remediation services	562	1,711	1,781	70	4.1%	25.2%	100
Air transportation	481	336	396	60	17.9%	6.5%	500
Machinery manufacturing	333	2,193	2,241	48	2.2%	-7.6%	250
Utilities	221	1,865	1,905	40	2.1%	-9.6%	200
Truck transportation	484	5,951	5,990	39	0.7%	10.6%	100
Computer and electronic product manufacturing	334	3,147	3,125	-22	-0.7%	-19.3%	250
Electrical equipment and appliance mfg.	335	614	563	-51	-8.3%	-13.5%	250
Transportation equipment manufacturing	336	9,300	8,323	-977	-10.5%	-10.5%	500
Total for 26 Target Industries				20,814			26,000

Source: DOL adjusted by Planning Decisions, Inc

As projected by DOL, the sectors targeted in Table 3 will account for nearly 21,000 additional jobs in Maine by 2018. Dropping the declines in transportation equipment as an overstated effect of the auto industry and the loss in computer and electronic manufacturing and electrical equipment manufacturing as offset by known expansions in Maine's electrical transmission grid and ongoing development in the state's renewable energy components industry brings the total to approximately 22,000 new jobs. Adding another 4,000 jobs for successful attraction and development of new companies at Brunswick Landing brings the total to approximately 26,000 new jobs.

A total of 26,000 new jobs over a ten-year period may not seem a large number in a state economy with over 600,000 jobs. It is less than the number of jobs lost during the Great Recession of 2007-09. It is important to remember, however, that these are targeted jobs in high-growth sectors. It is also important to remember that the jobs in these industries, particularly the most highly skilled occupations in these industries pay above average wages.

Table 4 presents the average overall wages paid in 2009 in these target industries as well as the entry level wages and the wages earned by those at the 75th percentile among all wage earners in the industry, that is the lowest salary in the top 25 percent of wage earners.

It is notable here, that in 15 of the 26 target sectors the average wage exceeds the total Maine average wage and that in 14 of the 26 target sectors the top 25th percentile salary exceeds the all-Maine average for that standard. It is also important to note that several of the target industries such as air transport services, information services and motion picture and sound recording are relatively new to Maine and pay wages far below those paid by more established businesses to Maine's south. The point of targeting these industries is to try to grow not just jobs, but wages. Finally, it is important to note that while many of the health, social service and tourism oriented industries have low average and low entry wages as entire industries, they are important pillars of the Maine economy and have occupations within their industries that pay substantially higher wages. The report addresses this question in more detail below.

Table 4: Target Sectors for SMCC Midcoast Campus, 2009 Wages, Maine

NAICS Sector	Target Industries	Average	Entry Level	Top 25th Percentile
325	Chemical manufacturing	$57,396	$28,975	$69,489
621	Ambulatory health care services	$56,220	$24,516	$61,417
541	Professional, Scientific and Tech Services	$55,908	$27,403	$68,325
518	ISPs, search portals, data processing, information	$52,445	$28,447	$64,177
622	Hospitals	$52,259	$24,061	$63,032
221	Utilities	$50,403	$32,377	$59,631
336	Transportation equipment manufacturing	$49,839	$37,024	$54,962
334	Computer and electronic product manufacturing	$45,085	$21,803	$55,301
333	Machinery manufacturing	$44,328	$26,171	$49,406
335	Electrical equipment and appliance mfg.	$41,960	$30,453	$49,788
332	Fabricated metal product manufacturing	$41,750	$25,592	$47,096
230	Construction	$38,896	$24,754	$45,421
312	Beverage manufacturing	$38,443	$22,015	$44,518
484	Truck transportation	$37,691	$24,047	$45,551
326	Plastics and rubber products manufacturing	$37,685	$22,412	$41,149
562	Waste management and remediation services	$35,830	$21,363	$40,569
339	Miscellaneous manufacturing	$35,201	$19,899	$41,144
710	Arts, Entertainment & Recreation	$33,690	$16,934	$37,793
561	Administrative and support services	$33,048	$19,119	$36,098
512	Motion picture and sound recording industries	$31,926	$17,146	$37,752
487	Scenic/sightseeing transport & transport support	$31,470	$17,827	$36,127
624	Social assistance	$28,430	$18,336	$32,532
623	Nursing and residential care facilities	$28,357	$18,951	$31,162
485	Transit and ground passenger transportation	$25,844	$17,451	$30,333
481	Air transportation	$24,596	n.a.	n.a.
720	Accommodation & Food Service	$23,980	$16,619	$26,384
	Maine All Industry Total	$36,660		$43,688

Source: Maine Department of Labor, Center for Workforce Research and Information

Finally, if Maine can succeed in filling these jobs, the wages they pay and their supply chain linkages to suppliers will create sales for many existing Maine businesses and thus many more jobs that are not specifically targeted as the focus for SMCC's program development. The report examines these "multiplier" effects in Section 7 below.

Identify Target Occupations

Having determined the target industrial sectors on which the SMCC Midcoast campus should focus, its next step is to estimate the occupational breakdown of the new jobs in these sectors. Just as the NAICS Code system categorizes businesses according to the primary type of product or service it provides—food, electrical components, telephone network repair, a hotel room—so the Standard Occupational Code (SOC) system categorizes workers within businesses according to what they know and do—mechanic, accountant, sales person. The U.S. Department of Labor categorizes workers with similar job duties and in some cases skills, education and/or training into one of 840 detailed occupations.[8]

The task for SMCC, therefore, is to identify the SOC classifications for its target industries, add them up across all the industries, sort out those occupations requiring some sort of higher education, compare those education requirements to those already offered in Maine, calculate any gaps between skills needed and education programs offered and use that gap as a guide for curriculum development.

Rather than detail each calculation individually, this report simply illustrates the calculation process in outline format and then presents the results. Table 5 presents the analytical framework. Row headings list occupational categories, here for illustrative purposes, listing Chief Executive, Human Resources Manager, Microbiologist and Lathe Operator. Column headings are NAICS industry categories, here for illustrative purposes, Fabricated Metal Products, Professional Services, Air Transportation and Arts and Entertainment.

Each cell in the matrix contains the share of total employment in an industry allocated to each occupation. By applying these percentages to the total employment expected for each industry, and then summing across each row, it is possible to derive the total number of jobs in each occupation required for the total number of jobs projected for all the target industries. These occupational totals can then be further subdivided by education and training requirements.

9. For a complete listing of the SOC classification system see http://www.bls.gov/soc/#materials.

Table 5: Industry/Occupation Matrix for SMCC Midcoast Campus, illustration only

		NAICS Code	332	541	etc.	481	71	
Soc Code	title	Description	Fabricated metal product manufacturing	Professional, Scientific and Tech Services	etc.	Air Transportation	Arts, Entertainment & Recreation	Total
11-1011	Chief Executives	Plan, direct, or coordinate operational activities at the highest level of management with the help of subordinate executives and staff managers	14	81		05	09	61
11-3021	Human Resources Managers	Computer and Information Systems Manager	04	203		04	01	141
51-4034	Lathe and Turning Machine Tool Setters, Operators, and Tenders	Set up, operate, or tend lathe and turning machines to turn, bore, thread, form, or face metal or plastic materials, such as wire, rod, or bar stock.	70	01		0	0	12
etc.			…	…	…	…	…	…
etc,			…	…	…	…	…	…
Total			403	1,999		497	500	26,000

After extensive examination of DOL sites and a discussion with Maine's Occupational Employment Statistics (OES) program manager, PDI determined that while there were data for the occupational breakdown for each industry category (NAICS Code), these breakdowns were unique to each code. There was no common matrix across all industries with which to add the number of occupations required in one industry with those required in the same occupation from another industry. PDI therefore constructed such a cross matrix specifically for the target industries identified in Table 3 above. It amounts to a matrix of 635 rows (one for each of the 635 different occupations covered) and 26 columns (one for each of the 26 targeted growth industries).

Table 6 presents the results of that analysis in order of Standard Occupational Code by major (two-digit) occupational category. A more detailed listing of healthcare related occupations (highlighted in **bold**) is included in Appendix One.

Table 6 Maine Occupational Demand by Two-Digit SOC Required by Target Industry Projections

SOC	Occupational Description	Jobs
		26005
11-0000	Management Occupations	1,261
13-0000	Business and Financial Operations Occupations	954
15-0000	Computer and Mathematical Occupations	1,518
17-0000	Architecture and Engineering Occupations	543
19-0000	Life, Physical, and Social Science Occupations	264
21-0000	Community and Social Services Occupations	512
23-0000	Legal Occupations	177
25-0000	Education, Training, and Library Occupations	292
27-0000	Arts, Design, Entertainment, Sports, Media Occupations	382
29-0000	Healthcare Practitioners and Technical Occupations	3,837
31-0000	Healthcare Support Occupations	1,904
33-0000	Protective Service Occupations	246
35-0000	Food Preparation and Serving Related Occupations	2,428
37-0000	Building/Grounds/Cleaning/Maintenance Occupations	836
39-0000	Personal Care and Service Occupations	1,057
41-0000	Sales and Related Occupations	711
43-0000	Office and Administrative Support Occupations	4,495
45-0000	Farming, Fishing, and Forestry Occupations	12
47-0000	Construction and Extraction Occupations	1,118
49-0000	Installation, Maintenance, and Repair Occupations	615
51-0000	Production Occupations	1,687
53-0000	Transportation and Material Moving Occupations	1,155
	Total, All Occupations	26,000

Source: Bureau of Labor Statistics, Standard Occupational Classification Policy Committee (SOCPC)

Identify Skill Gaps

Having identified target industries with potential for significant growth in Maine, and having translated this potential job growth from industry to occupation, the next step in building the most appropriate educational program for the SMCC Midcoast campus is to identify skill gaps, that is, to identify the education and training required to produce workers qualified for the 26,000 jobs identified above and compare that to the number of graduates currently leaving Maine's post-secondary institutions.

Table 7 groups the 26,000 targeted jobs by level of education/training required.

Table 7 Target Occupations by Level of Education/Training Required

Level	Education/Training Requirement	Definition	2008-18 jobs
11	First Professional degree	Completion of a 6-year academic program	571
10	Doctoral degree	Completion of a 3-year academic program beyond a bachelor's degree	75
9	Master's degree	Completion of a 1- to 2-year academic program beyond a bachelor's degree	436
8	Bachelor's degree plus work experience	Completion of a 4-year academic program or higher degree beyond high school, plus related occupational experience	1,227
7	Bachelor's degree	Completion of a 4-year academic program beyond high school	3,085
6	Associate degree	Completion of a 2-year academic program beyond high school	2,948
5	Post-Secondary vocational training	Completion of a vocational training program	2,139
4	Work experience in a related occupation	Related occupational experience leading to development of specific skills	1,770
3	Long-term on-the-job training	More than 1 year of on-the-job training or a combination of training and classroom instruction	1,203
2	Moderate-term on-the-job training	1 to 12 months of on-the-job training	4,850
1	Short-term on-the-job training	Up to 1 month of on-the-job training	7,805
	All Levels		26,109
	Levels 2 through 7		15,995

Source: Maine Department of Labor, Labor Force Projections 2008-2018

The jobs requiring education levels 2 through 7 are appropriate as targets for SMCC. Level 7, Bachelor's degree is included because SMCC should aim to provide a beginning pathway to such degrees in target occupations where there may be a skills gap. Jobs at these educational levels cover 406 specific occupations and total nearly 16,000 jobs.

Table 8 lists the number of graduates from all Maine post-secondary institutions in 2009 by Classification of Instructional Program (CIP) Code.

Table 8 Associate and Bachelor's Degrees Awarded in Maine, 2009

CIP Code	Description of Instructional Program	Associate 2009	Bachelor's 2009
99	All Degrees	2,636	6,909
01	Agriculture and related sciences	12	83
03	Natural resources and conservation.	4	181
09	Communication, journalism, related programs	31	226
10	Communications technologies/technicians and support services	24	26
11	Computer & information sciences & support	21	59
12	Personal and culinary services	38	n a
14	Engineering	n.a.	222
15	Engineering technologies/technicians	165	156
22	Legal professions and studies	51	4
26	Biological and biomedical sciences	5	449
27	Mathematics and statistics	n.a.	61
31	Parks, recreation, leisure, and fitness studies	6	122
40	Physical sciences	n a	123
41	Science technologies/technicians	7	8
42	Psychology	n.a.	144
43	Security and protective services	140	94
44	Public administration & social service	28	97
45	Social sciences	n a	781
46	Construction trades	73	n.a.
47	Mechanic and repair technologies/technicians	137	n.a.
48	Precision production	57	n a
49	Transportation and materials moving	5	47
50	Visual and performing arts	9	295
51	Health professions and related clinical sciences	895	816
52	Business, management, marketing and related support services	414	737

Source: National Center for Education Statistics, http://nces.ed.gov/ipeds/sdc/CDT_VariableSelector.aspx

The next step in the program development process is to link each of the 16,000 target jobs as they are divided over their constituent 406 occupations to specific educational programs. This will constitute the 10-year demand for whatever skill set each of these occupations requires. It is then possible to compare this demand to the 10-year supply of graduates from each associated program, as reported by the U.S. Department of Education, National Center for Education Statistics, and identify skills gaps. Occupations where the 10-year demand for workers exceeds ten times the most recent year's reported total of graduates are instructional areas on which SMCC ought to focus in developing programs for its Midcoast campus. Conversely, fields of study where ten times the most recent year's number of graduates exceeds the projected 10-year demand for workers appear to be areas where SMCC could redirect its resources.

One problem with this approach is that not every one of the 406 specific occupations required by the targeted industries has one and only one appropriate education/training entryway. Workers come to jobs in a variety of ways. A technical writer, editor or translator may come to his/her position from a program in CIP #09 Communications and Journalism or through CIP #45 Social Sciences. A day care provider or social service worker may come to his/her position through CIP #42 Psychology or CIP #44 Public Administration & Social Service or CIP #45 Social Sciences. To make at least an initial attempt to account for this phenomenon, PDI evaluated each of the 406 target occupations and assigned a primary and a secondary CIP code. We then allocated the 10-year demand total across the related CIP codes in proportion to the number of jobs involved. For most occupations, however, one primary CIP code seemed to apply. For electricians, for example, CIP #46 Construction Trades applied. For semiconductor processors, CIP #48 Precision Production applied.

The one area where precise assignment to a particular CIP code was not completely satisfactory was in the area of production or management supervisors where both precise technical skills and some level of management training seemed to be called for. Of the 1,625 job growth projected in the Precision Production field, 282 or 17% were first line supervisors. These jobs would seem, therefore, to require some level of the business management training of CIP #52.

Table 9 presents a picture of the supply-demand balance (and imbalance) over the ten-year projection period. It shows the supply of graduates Maine would have if it continued to produce graduates over the next ten years at the same level and in the same programs as it did in 2009. It then presents the number of graduates it will need in each of these programs if it is to meet the job growth targets presented in Tables 3, 5 and 6 above. With these two numbers, it is then possible to identify surpluses and shortages that can serve as a guide to future program development.

Table 9 Supply-Demand Totals for Selected Educational Programs, 2008-18

CIP Code	Field of Study	10 Year Supply Assoc.	10 Year Supply Bach.	10 Year Demand Assoc.	Surplus or (Shortage) Assoc. Only	Surplus or (Shortage) Assoc. & Bach.
11	Computer and information sciences and support services	210	590	1,777	(1,567)	(977)
48	Precision production	570	0	1,625	(1,055)	(1,055)
49	Transportation materials moving	50	470	532	(482)	(12)
46	Construction trades	730	0	1,033	(303)	(303)
12	Personal and culinary services	380	0	660	(280)	(280)
41	Science technologies/technicians	70	80	246	(176)	(96)
42-44-45	Psychology, Public Administration, Social Sciences	280	10,220	413	(133)	10,087
31	Parks, recreation, leisure, and fitness studies	60	1,220	138	(78)	1,142
50	Visual and performing arts	90	2,950	146	(56)	2,894
26	Biological and biomedical sciences	50	4,490			50
09	Communication, journalism, and related programs	310	2,260	250	60	2,320
40	Physical sciences	0	1,230	17	(17)	1,213
01-03	Agriculture, natural resources and conservation	160	2,640	35	125	2,765
10	Communications technologies and support services	240	260	105	135	395
45	Social Sciences	0	7,810		0	7,810
22	Legal professions and studies	510	40	118	392	432
47	Mechanic and repair technologies/technicians	1,370	0	398	972	972
43	Security and protective services	1,400	940	89	1,311	2,251
15	Engineering technologies/technicians	1,650	1,530	204	1,446	2,976
52	Business, management, marketing and related services	4,140	7,370	2,325	1,815	9,185
51	Health professions & related biological & clinical sciences	9,000	8,160	4,373	4,627	12,639
27	Mathematics and statistics	0	610	416	n a	194
51-26	Health Professions & Biological Sciences				0	0
14	Engineering	0	2,220	330	n a	1,890
	Total	21,220	41,560	15,213	6,007	47,567

Sources: Department of Labor, Department of Educations and PDI analysis

Column 1 lists the CIP code, column 2 lists the description of the field of study covered by that code, columns 3 and 4 list the 10-year supply of graduates in that field that Maine is now producing, that is, ten times the number of students graduated in 2009. Column 3 lists associate degree graduates, and column 4 lists bachelor's degree graduates. Column 5 lists the 10-year demand for such graduates, that is the number of workers required to meet the industrial employment targets listed in Table 3. Finally, columns 6 and 7 list the surplus or (shortage) in each field derived by subtracting demand for workers from supply of graduates, first for associate degrees only and second for the total of associate and bachelor's degrees. The table is arranged in descending order of shortage considering associate degrees only.

There are two significant points to be drawn from Table 9. The first is that, if the current supply-demand imbalance persists, Maine will suffer a severe shortage of workers in computer, information and related support services and in precision production occupations.[9] If Maine does not reallocate education and training resources to address this existing and potentially growing labor supply gap, the state's economic prosperity will be threatened and the hopes for development of Brunswick Landing as a major industrial and research center will be severely threatened. A second, although less severe, skills gap exists in CIP

10. A detailed list of specific occupations in precision productions is included in Appendix Two.

#49 Transportation and Materials Moving occupations, CIP #46 Construction Trades, CIP #12 Personal and Culinary Services and CIP #41 Science Technologies and Technicians.

A second important point needs to be made regarding CIP #14 Engineering, CIP #15 Engineering Technologies and Technicians, CIP #52 Business Management and CIP #51 Health Professions. In all, the current rate of graduates in total exceeds the target industry demand. It is necessary, therefore, to drill down into the specific occupations to look for areas of supply-demand imbalance relevant for the Midcoast Campus.

Table 10 examines the supply-demand data for Engineering in more detail.

Table 10 Target Industry Demand for Engineering Related Occupations

SOC Code	Occupation	Jobs	Educational Requirement	Wages, 2009
17-2141	Mechanical Engineers	57	Bachelor's degree	$74,400
17-2112	Industrial Engineers	56	Bachelor's degree	$69,980
17-2051	Civil Engineers	46	Bachelor's degree	$67,840
17-2071	Electrical Engineers	37	Bachelor's degree	$90,680
17-2199	Engineers, All Other	37	Bachelor's degree	$81,320
17-2072	Electronics Engineers, Except Computer	23	Bachelor's degree	$80,820
17-2011	Aerospace engineers	18	Bachelor's degree	$92,520
41-9031	Sales Engineers	14	Bachelor's degree	$66,900
17-2021	Agricultural engineers	9	Bachelor's degree	$68,730
17-2041	Chemical Engineers	9	Bachelor's degree	$90,640
17-2081	Environmental Engineers	9	Bachelor's degree	$62,000
17-2031	Biomedical Engineers	5	Bachelor's degree	$70,540
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	5	Bachelor's degree	$52,740
17-2131	Materials Engineers	4	Bachelor's degree	$82,660
17-2121	Marine Engineers and Naval Architects	1	Bachelor's degree	$79,300
19-2021	Atmospheric and Space Scientists	1	Bachelor's degree	$78,000
	Subtotal Bachelor's Degree	331		
17-3023	Electrical and Electronic Engineering Technicians	30	Associate degree	$48,020
17-3011	Architectural and Civil Drafters	25	Postsecondary voc. training	$42,220
17-3019	Drafters, All Other	20	Postsecondary voc.training	$42,080
51-9081	Dental Laboratory Technicians	17	On-the-job training	$35,380
17-3022	Civil Engineering Technicians	16	Associate degree	$44,540
17-3026	Industrial Engineering Technicians	14	Associate degree	$46,500
17-3029	Engineering Technicians, Except Drafters, All Other	10	Associate degree	$69,820
17-3027	Mechanical Engineering Technicians	9	Associate degree	$52,860
17-3025	Environmental Engineering Technicians	8	Associate degree	$39,060
51-8021	Stationary Engineers Boiler Operators	8	Long-term OJT	$41,920
51-8031	Water and Liquid Waste Treatment Plant and System Operators	7	Long-term OJT	$39,780
51-9082	Medical Appliance Technicians	5	Long-term OJT	$35,780
17-3024	Electro-Mechanical Technicians	3	Associate degree	$54,460
51-8011	Nuclear power reactor operators	2	Long-term OJT	$52,460
51-8093	Petroleum pump operators, refinery operators and gaugers	2	Long-term OJT	$55,010
	Subtotal Associate's Degree & OJT	176		

Sources: Department of Labor, Department of Educations and PDI analysis

According to the DOL industry-occupation matrix, the 26,000 targeted jobs include 331 requiring a Bachelor's degree in Engineering and 176 requiring an Associate degree or related experience

Three points need to be made with regard to these numbers and their meaning for SMCC's development of the Midcoast campus. First, Maine's engineer to total employment ratio in the targeted industries reflects the state's current economic structure. As these industries grow and hopefully increase their R&D components in Maine, that ratio may increase. Second, Maine's engineering graduation rate is based not on Maine jobs only, but on jobs worldwide. Maine is naturally preparing students for the broadest possible careers in a field that suffers skill shortages across the globe. In short, a surplus of graduates relative to Maine-only jobs is not a problem for students seeking productive careers wherever they might go. Finally, an explicit goal of Brunswick Landing is to become a research center, to bring not just production facilities of existing businesses, but testing facilities for industries that may not fully exist today, particularly in fields related to energy production, distribution and conservation. This goal indicates a clear need to maintain a well-understood career pathway into engineering at the Midcoast campus and an instructional structure that is sufficiently flexible to serve whatever specific engineering related field may prove most in demand over the coming decade.

Table 11 examines in more detail the supply-demand data for occupations in business management that require Associate degrees. It highlights the fact that business management occupations that involve social skills—buying/selling/supervision—tend to pay much more than those with purely manual/clerical skills. While on an overall basis, the current pattern of supply seems adequate to meet the state's future needs, the one area that would seem to be significant for the Midcoast campus are those occupations involving first line supervisory skills. Such an orientation would both complement the need for precision production workers and provide a career path for those who may seek advancement from those fields.

Table 11 Target Industry Demand, Business Occupations, Associate's Degree

SOC Code	Occupation	Jobs	Educational Requirement	Wages, 2009
43-4051	Customer Service Representatives	378	Moderate-term on-the-job training	$30,661
43-6014	Secretaries, Except Legal, Medical, Executive	302	Moderate-term on-the-job training	$29,372
43-3031	Bookkeeping, Accounting, Auditing Clerks	296	Moderate-term on-the-job training	$32,068
43-1011	First-Line Supervisors/Managers of Office and Administrative Support Workers	292	Work experience in related occup.	$44,252
43-6011	Executive Secretaries and Administrative Assistants	235	Work experience in related occup.	$41,081
43-9021	Data Entry Keyers	223	Moderate-term on-the-job training	$26,971
41-3099	Sales Representatives, Services, All Other	163	Work experience in related occup.	$51,221
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	91	Work experience in related occup.	$51,171
Nov-99	Managers, All Other	74	Work experience in related occup.	$73,053
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	73	Work experience in related occup.	$63,593
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	55	Long-term on-the-job training	$51,021
43-3051	Payroll and Timekeeping Clerks	41	Moderate-term on-the-job training	$32,161
43-3061	Procurement Clerks	17	Moderate-term on-the-job training	$31,898
13-2082	Tax Preparers	16	Moderate-term on-the-job training	$28,820
41-1011	First-Line Supervisors/Managers of Retail Sales Workers	14	Work experience in related occup.	$38,253
43-9022	Word Processors and Typists	13	Moderate-term on-the-job training	$35,400
13-2072	Loan Officers	11	Moderate-term on-the-job training	$61,300
23-2093	Title Examiners, Abstractors, Searchers	8	Moderate-term on-the-job training	$38,620
43-9041	Insurance Claims, Policy Processing Clerks	8	Moderate-term on-the-job training	$32,970
Nov-81	Lodging Managers	7	Work experience in related occup	$57,173
13-1022	Wholesale, Retail Buyers, Except Farm Products	3	Long-term on-the-job training	$49,714
43-4011	Brokerage Clerks	2	Moderate-term on-the-job training	$43,650
13-1031	Claims Adjusters, Examiners, Investigators	2	Long-term on-the-job training	$54,020
43-4141	New Accounts Clerks	1	Work experience in related occup.	$31,500
	Subtotal Demand for Associate's Degree	2,325		

Sources: Department of Labor, Department of Educations and PDI analysis

Table 12 below examines in more detail the supply-demand data for healthcare occupations that require Associate degrees. The most significant fact evident in the table is the dual nature of the salary levels involved. For the 26 occupations listed, the average income per occupation is $40,150. However, ten of the occupations pay more than $40,000 per year. For these occupations, the average annual salary in 2009 was just over $54,000. For the 16 occupations with below average annual salaries, on the other hand, their average was only $31,500, far below the all-sector average.

This bimodal income distribution together with the overall surplus of projected healthcare labor supply indicates that the Midcoast campus needs to focus any attention on healthcare training to the above average wage occupations noted in Table 12.

Table 12 Target Industry Demand for Healthcare Related Occupations

SOC Code	Occupation	Jobs	Educational Requirement	Wages, 2009
29-1111	Registered Nurses	1,613	Associate degree	$64,300
31-1012	Nursing Aides, Orderlies, and Attendants	712	Postsecondary voc training	$24,455
29-2061	Licensed Practical and Vocational Nurses	354	Postsecondary voc training	$38,465
43-6013	Medical Secretaries	292	Moderate-term OJT	$29,200
31-9092	Medical Assistants	275	Moderate-term OJT	$29,600
31-9091	Dental Assistants	158	Moderate-term OJT	$36,100
29-2034	Radiologic Technologists and Technicians	145	Associate degree	$53,100
29-2071	Medical Records and Health Information Technicians	100	Associate degree	$29,600
29-2021	Dental Hygienists	95	Associate degree	$65,020
29-2041	Emergency Medical Technicians/Paramedics	92	Postsecondary voc, training	$29,900
29-2012	Medical and Clinical Laboratory Technicians	92	Associate degree	$39,350
29-2055	Surgical Technologists	65	Postsecondary voc training	$40,500
29-2052	Pharmacy Technicians	52	Moderate-term OJT	$28,858
31-9094	Medical Transcriptionists	48	Postsecondary voc training	$31,900
29-2099	Other Health Technologists/Technicians	47	Postsecondary voc training	$41,425
31-2021	Physical Therapist Assistants	37	Associate degree	$41,400
29-2032	Diagnostic Medical Sonographers	36	Associate degree	$66,555
29-2031	Cardiovascular Technologists and Technicians	35	Associate degree	$51,725
29-2053	Psychiatric Technicians	34	Postsecondary voc training	$26,900
29-2081	Opticians, Dispensing	19	Long-term OJT	$33,200
29-2033	Nuclear Medicine Technologists	15	Associate degree	$68,700
31-2011	Occupational Therapist Assist	14	Associate degree	$34,500
29-2051	Dietetic Technicians	13	Postsecondary voc training	$25,700
29-2054	Respiratory Therapy Technicians	11	Postsecondary voc training	$47,550
51-9083	Ophthalmic Laboratory Technicians	9	Moderate-term OJT	$29,010
39-5094	Skin Care Specialists	2	Postsecondary voc training	$36,790
	Subtotal Demand for Associate's Degree	4,373		

Sources: Department of Labor, Department of Educations and PDI analysis

Finally, it is important to look in detail at CIP categories 12, personal & culinary services, and 31, recreation and leisure services. These might be called the "tourist industry" occupational categories not included in business management.

Table 13 Target Industry Demand for Tourism Related Occupations

SOC Code	Occupation	Jobs	Educational Requirement	Wages, 2009
35-2014	Cooks, Restaurant	196	Long-term on-the-job training	$23,300
35-1012	First-Line Supervisors/Managers of Food Preparation and Serving	160	Work experience in a related occupation	$31,100
35-2012	Cooks, Institution and Cafeteria	95	Moderate-term on-the-job training	$25,500
35-2019	Cooks, All Other	50	Moderate-term on-the-job training	$23,300
11-9051	Food Service Managers	40	Work experience in a related occupation	$51,000
37-1011	First-Line Supervisors/Managers of Housekeeping and Janitorial Workers	35	Work experience in a related occupation	$36,400
51-6011	Laundry and Dry-Cleaning Workers	35	Moderate-term on-the-job training	$22,100
35-1011	Chefs and Head Cooks	25	Work experience in a related occupation	$45,500
51-3011	Bakers	13	Long-term on-the-job training	$28,700
39-6022	Travel guides	5	Moderate-term on-the-job training	$24,800
35-2013	Cooks, Private Household	3	Long-term on-the-job training	$23,300
39-5012	Hairdressers, Hairstylists, and Cosmetologists	3	Postsecondary vocational training	$26,400
	Subtotal Demand for Associate's Degree	660		

Sources: Department of Labor, Department of Educations and PDI analysis

As is true for healthcare occupations, those in the tourism sector tend to be bi-modal—most positions pay relatively low wages, but food service managers, head chefs and first line supervisors earn far higher wages. Again, this points to specific skills training as the needed focus for the Midcoast campus.

Design Program Offerings & Instructional Delivery Strategy

Having identified areas of need critical for achieving the state's job growth targets, the next step for development of SMCC's Midcoast campus is to consider how to design and offer specific instructional programs. To help guide this process, PDI conducted over twenty interviews with business owners, representatives of trade associations, educators, federal, state, regional and municipal government officials, managers of non-profit agencies and interested citizens. Interviews were open-ended and conversational, designed to elicit opinions about what sort of education and training Maine needs, how it can best be designed and delivered and what suggestions respondents would offer to SMCC to ensure the greatest possible success for its Midcoast campus.[11]

While the interviews were wide ranging, they did reveal several common themes: two with regard to an assessment of current education/training needs and two with regard to suggestions for improvement.

With regard to the current supply-demand situation, interviewers generally confirmed the needs identified in the analysis presented above. There is a tremendous need for training programs for all of the skills necessary for modern manufacturing. What the Classification of Instructional Programs (CIP) system calls "Precision Production" and "Computer and Information Sciences" have generally been reaffirmed by respondents as the areas of greatest need. Several respondents decried the general perception that "manufacturing is dead" and said that in fact manufacturing is thriving. Several cited the misperception that manufacturing is "dirty" and "dangerous," that it is a "dead-end." In fact, the greatest need Maine's manufacturers have today is for workers with the capability and willingness to learn new skills and how to operate new machinery as part of an ongoing career development process.

The second observation common to many respondents was a frustration with the higher education system's responsiveness to this need. Many stated that while formal degree and certificate programs were important, their greatest need was for shorter term, more job specific training—both to meet established certificate programs and even non-certificate company specific needs. At the same time, respondents noted that such programs needed to be not one-time, one-size-fits-all programs, but ongoing and varied learning/training "experiences" designed to meet the needs of individual companies and individual workers.

In short, respondents generally agreed with the skill gaps identified above and expressed a frustration that the higher education system was not addressing these needs, at least not adequately. In fact, the Maine Manufacturers Association is seeking funding to create its own training system based on a model developed by the Manufacturers Association of South Central Pennsylvania.[12]

In this regard, it must be noted that short-term, job-specific training is exactly the mission of the Maine Quality Centers (MQC) program of the Maine Community

11. A list of interviewees is included as Appendix Three at the end of this report.
12. http://www.mascpa.org/education_overview.html.
13. See http://www.mccs.me.edu/business/mqc.html for more detail and a list of companies served.

College system.[12] The mission of the MQC is "to encourage businesses to locate or expand operations in Maine by providing customized workforce training at *no cost* to the business or to trainees". The MQC provides assistance in identifying specific workforce needs and in recruiting, screening and training specific workers. MQC will deliver training programs on an employer site, at a community college or a separate location. MQC programs can be for a single company or for a group of companies who form a training partnership. To participate, businesses must create a minimum of eight new full-time positions located in Maine or be part of a training partnership that collectively meets the eight full-time jobs requirement. The new jobs must meet a minimum skill requirement, offer a competitive salary and provide benefits. Over its history, the MQC program has worked with over 200 companies to create over 11,000 jobs.

At first blush, it seems difficult to reconcile the expressed discontent of at least some businesses with the responsiveness and flexibility of the MQC program. One explanation might be that the business community is simply not well informed about the MQC program. Another is that individual, project-by-project program development is not sufficiently regular and predictable for companies and their employees who are looking for longer-term career planning and development options. Both these possibilities point to areas where SMCC could conduct further investigations as part of the development of its Midcoast campus curriculum. They seem to point to a shared business-education process of developing a scheduled curriculum rather than either a series of business-specific programs or a purely college-developed formal curriculum.

That businesses seeing their own specific, ever-changing, training needs would view an educational establishment with an apparently cumbersome system of curriculum development and a bias toward filling its own classrooms as unresponsive is natural. By the same token, that a public institution with a limited budget, widely varied demands and its own costs to cover would see business demands as unrealistic is equally understandable. Each enterprise unavoidably operates within its own constraints.

The great opportunity presented by the charge to develop a Midcoast campus, therefore, is SMCC's greatest challenge—how to bridge this gap between the expectations and cost structures of employers and educators. Based on a combination of skills gap analysis and personal interviews, the best way to achieve this goal is to:

- Establish a relatively narrow focus;
- Establish an effective employer-educator collaborative process;
- Develop clearly articulated career pathways;
- Break educational/learning experiences into small components; and
- Establish an ongoing, third party review process.

Establish a relatively narrow focus

Meeting the needs of the "industries of the future" is a hopelessly vague assignment. Finding a core of skills and attitudes common to the manufacturing industries—the specific "precision production" skills needed by Maine's growing manufacturers and those that could grow in Maine (particularly at Brunswick

Landing) is a more achievable goal. The products of composites firms, machine shops and avionics companies are vastly different, but many of the skills needed for their production are common—foresight, problem solving, clear communication as well as specific manual capabilities and experience—across all. For manufacturing in general, the Midcoast should establish a common and basic curriculum. In addition, it should focus on CIP #11 Computer and information sciences and support services, CIP #41 Science technologies/technicians, CIP #49 Transportation and materials moving and CIP #46 Construction trades. L.L. Bean in particular cited the need for regular training in English as a second language and general computer skills. Working with the company's training officials, SMCC could undoubtedly fill specially designed courses on a regular basis. Similarly, but at a more advanced training level, Bath Iron Works (BIW) cited the need for advanced training for engineers required for particular work related to ever changing Defense Department contracts.

Establish an effective employer-educator collaborative process

Wags say that cooperation is an unnatural act. Employers and educators each have their own fundamental needs and, while paying lip service to cooperation, revert to meeting their own needs when the going gets tough. Respondents all agreed that industry-education advisory committees were necessary, but gave them mixed reviews in practice. Some worked, some didn't. The keys to success for those that were successful included:

- Established and consistent membership; the same people with the same interests and commitment belong and participate;
- Regular but not overly frequent meetings—two or three times per semester;
- Iterative feedback—What did and didn't work? What new knowledge is required? What has been tried elsewhere?
- Clear evidence of authority and impact—What we do matters; it affects instructional activity and production/work activity.

Develop clearly articulated career pathways

One of the most frequently voiced criticisms of the labor market today is that entrants have very unclear (if any) pictures of how one job can lead to another. If one enters field X, what future opportunities open up? One of the most positively received elements of the proposed Midcoast campus is that it will have formal links with the University of Maine College of Engineering and the Maine Advanced Technology & Engineering Center (MATEC). The key to the success of these elements of the campus is that they interact with other instructional activities and will be part of the employer-educator collaborative process noted above.

The greatest challenge to community college educators today is trying to keep abreast of the constantly changing training needs of growing businesses. Brunswick Landing envisions itself as becoming a renewable energy research center. This will require being able to serve industries that don't even have formal definitions today—advanced battery production, hydrogen fuel cell production, solar power, more efficient wind turbines, more efficient electric generation grids. At the same time, Maine is rolling out a fiber-based

infrastructure for faster, more efficient internet connections. As this digital infrastructure becomes available, Maine will be able to develop and use more devices, more software applications, more network connecting and switching machinery and more Maine citizens and businesses will be able to find more ways to use the internet. What new jobs will these developments make available for Maine?

Fortunately the same technologies that are changing the labor market so radically are also making it possible to understand it better. Newly established companies such as Monster.com and Burning Glass technologies gather millions of job postings and resumes on a daily basis. Analysis of these data—called Real-Time Labor Market Information (RTLMI)—enable both employers and educators to understand changing job requirements literally on a day-to-day basis. The Midcoast campus should incorporate this technology into its efforts to build career pathway pictures for both its students and for their would-be employers. Building industry-educator program committees and articulating career pathways should constitute a mutually reinforcing interactive process that demands ongoing effort from both partners.

It is particularly important, therefore, that SMCC has recently been selected by Jobs for the Future (JFF) to be a member of its Labor Market Information Innovators Network. This grant will enable SMCC to collaborate with seven other community colleges across the country to collaborate in utilizing proprietary RTLMI technologies and data to inform curriculum and program development. This initiative will allow the Midcoast campus to benefit from the most recent and current definitions of employer needs for specific labor force skills and experiences.

One important reason to focus on articulating career pathways is that the effort will develop its own demand for education. One frequently cited demand among employers is leadership and supervisory training, particularly for first-line supervisors and customer service representatives. In short, SMCC must focus not simply on instilling technical skills in its students, but also in complementing that training with social skills that will enable those with both technical and managerial skills the opportunity to advance to supervisory positions.

Break educational/learning experiences into small components

The most common criticism of educational institutions by employers is "lack of flexibility." The most common criticism of employers by educators is failure to understand the cost structure of education. To use a manufacturing analogy, a school can't afford to constantly make individual samples in constantly changing shapes, sizes and colors. It needs some minimum level of production volume to cover its overhead and set-up time.

One way to address this problem is the collaborative program development model noted above. A second is to break learning activities into smaller components at least some of which can be shared across different industry sectors. A third is to offer these individual learning components at various times and places, including on-line, so that students have a variety of access points to

the needed information and schools have a wider net for gathering students and thus covering set-up costs.

Establish an ongoing, third party review process

One final suggestion for designing an educational program for the Midcoast campus is to establish a regular review procedure. Given the wide ranging demands being placed on this initiative—new industries, new instructional methods, new organizational procedures—it is important that the effort be evaluated in a formal and ongoing way. Such an evaluation should be conducted by a non-involved third party and should include two components—outcome results and procedural lessons.

The fundamental success of the Midcoast campus will be determined by the employment and earnings history of its graduates. Fortunately, Maine is in an ideal position to measure that success. The Maine Department of Labor, Center for Workforce Research and Information (CWRI) has an already established relationship with SMCC for long-term monitoring of the labor market outcomes of its graduates. By anonymously linking individual education records with individual wage records, CWRI can monitor the long-term employment and earnings of those workers who have gone through the various educational programs envisioned here. By reporting these outcomes on an annual basis, the Midcoast campus can serve three purposes:

- It can demonstrate to potential enrollees and their prospective employers the employment and earning outcomes of previous graduates;
- It can, over time, build patterns of career paths that will feed back into its curriculum development process in a fashion that is far more regular and rigorous than the current, largely anecdotal, information available from trying to follow alumni through individual contact information or irregular and expensive surveys; and finally
- It can help the ongoing employer-educator program advisory councils to refine the definitions of skills and certifications that constitute their most fundamental responsibility.

The second part of the third party evaluation—procedural lessons—involves process evaluation. It will address issues related to how programs are carried out. It will seek to identify:

- Impressions of participants about what is working, what is not, and why; participants should include administrators, educators, businesses and trainees. Responses should be collected through a combination of individual interviews, online surveys and focus groups;
- Actual job growth by sector compared to the projections presented in Table 3 above.

All five of these suggestions for increasing the success of the Midcoast campus go together, each reinforcing both the need for and the importance of the others. The fundamental point to be made here is that designing a means for determining success should be an integral part of designing the actual content of the program itself.

The Economic Impact of Success

There are two ways of looking at the economic impact of the Midcoast campus. The first and most immediate is the impact of building, equipping, staffing and operating the campus itself. The second, and more significant, impact is creation of some portion of the 26,000 new jobs identified as the strategic goal the Midcoast campus is intended to serve. The report treats each in turn.

1. Economic impact of campus creation & operation

Table 14 summarizes the investment that will be made to create the Midcoast campus.

Table 14 Midcoast Campus Construction Cost by Major Category

Item	Cost
Building Renovations	$2,788,200
Furnishings	$711,900
Software	$857,900
Design	$392,000
Total Direct Spending	$4,750,000

Source: SMCC; costs are rounded to the nearest hundred

To examine the total economic and fiscal impact of this investment, PDI used the IMPLAN input-output model for the state of Maine. This model traces the flow of the $4.75 million as it becomes sales to vendors supplying SMCC's contractors and their vendors and their vendors in successive rounds of supply-chain related spending. In a similar fashion, it traces the successive rounds of consumer spending as construction employees spend their pay in the local economy and the local stores receiving sales from that pay pass the money on to their workers and suppliers. Table 15 summarizes the total impact of this spending.

Table 15 Economic Impact of Midcoast Campus Construction

Item	Sales	Jobs	Income
Building Renovations	$2,788,200		
Furnishings	$711,900		
Software	$857,900		
Design	$392,000		
Direct Spending	$4,750,000	37	$1,600,000
Indirect & Induced Spending	$2,450,000	25	$800,000
Total Spending	$7,200,000	62	$2,400,000

Source: SMCC data and Todd Gabe Economic Contribution of the Proposed SMCC Midcoast Campus and Maine Advanced Technology & Engineering Campus University of Maine, January 2010

In addition to its economic impact, creation of the Midcoast campus will have a fiscal impact. The business sales and personal income generated by this investment will produce tax and fee income for Maine state and local governments. PDI used the IMPLAN model of the Maine economy to estimate that revenue. Table 16 summarizes the results.

Table 16 Fiscal Impact of Midcoast Campus Construction

Revenue Category	Amount
State Revenues	$217,000
Sales Taxes	$91,000
Income & Payroll Taxes	$100,000
Other State Taxes & Fees	$26,000
Local Revenues	$102,000
Property Taxes	$93,000
Other Local Taxes & Fees	$9,000
Total	$319,000

Source: IMPLAN based on sales and income totals from Table 15 Figures are rounded to avoid a false impression of precision

As a result of construction of the Midcoast campus, Maine state and local governments will receive over $300,000 in tax and fee revenue. Construction of the Midcoast campus—like all construction projects—is a temporary economic activity. The sales, employment, income and fiscal totals noted in Tables 15 and 16 will peak and then drop off over the length of the construction timetable. Operation of the campus, on the other hand, will generate ongoing economic activity. Each year the campus operates salaries will be paid, supplies purchased, buildings heated and maintained. And this spending will also set off further rounds of down-stream vendor and consumer-related spending that will build up a larger economic and fiscal impact than the direct campus budget. And, most importantly, these total impacts will not fade away, but continue on long as the campus operates. Tables 17 and 18 summarize these ongoing economic impacts.

Table 17 Economic Impact of Midcoast Campus Operation

Item	Sales	Jobs	Income
Building Renovations	$2,788,200		
Furnishings	$711,900		
Software	$857,900		
Design	$392,000		
Direct Spending	$4,352,600	40	$3,507,300
Indirect & Induced Spending	$3,786,200	70	$2,900,000
Total Spending	$8,138,800	110	$6,407,000

Source: SMCC data and Todd Gabe Economic Contribution of the Proposed SMCC Midcoast Campus and Maine Advanced Technology & Engineering Campus University of Maine, January 2010 SMCC plans to have 24 paid staff devoted to the Midcoast campus Approximately 270 courses will be taught by adjunct faculty on a per course basis Using average pay per section and a full-time equivalent salary base yields an estimate of 16 full-time equivalent jobs for adjuncts and a total of 40 direct jobs overall

At full operation, the Midcoast campus will have an operational budget of just over $4.3 million, employ 40 full-time-equivalent workers and pay wages of just over $3.5 million. The indirect and induced spending impact of this direct economic activity amounts to sales for Maine businesses of just over $8 million supporting 110 jobs earning an income of approximately $6.4 million.

These business sales and personal incomes will produce tax and fee income for Maine state and local governments of nearly $850,000 for as long as the campus operates at this level. Table 18 summarizes these results.

Table 18 Fiscal Impact of Midcoast Campus Construction

Revenue Category	Amount
State Revenues	$579,000
Sales Taxes	$243,000
Income & Payroll Taxes	$267,000
Other State Taxes & Fees	$69,000
Local Revenues	$270,000
Property Taxes	$247,000
Other Local Taxes & Fees	$23,000
Total	$849,000

Source: IMPLAN based on sales and income totals from Table 15 Figures are rounded to avoid a false impression of precision

2. Economic impact of job creation

Quite apart from its construction and operation, the ultimate success of the SMCC Midcoast campus will be measured by the degree to which it contributes to achieving the 26,000 job growth goal presented in Table 3 above. As noted in the previous section, the possibility exists today for following program graduates into the labor market and documenting their employment and earnings history. Such measures, however, will exist only in the future. They cannot be used to help justify the investments that must be made today to create the Midcoast campus. One way of making such a prospective investment evaluation, however, is economic impact analysis. What will be the impact on Maine—both in the target industries and in other industries linked to them through supplier and consumer relationships—if the state in fact achieves its 26,000 job goal in the industries targeted in Table 3?

Clearly it would be an overstatement to say that the SMCC Midcoast campus could produce these 26,000 new jobs over the coming decade. However, it would be instructive to ask the question, "What would be the total effect on Maine of 1,000 new jobs distributed across the target industries in proportion to the list in Table 3?". This would present some indication of the potential benefit to be derived from the investment proposed in the Midcoast campus.

To examine this possibility, PDI used the IMPLAN input-output model for the state of Maine to calculate the total economic impact of the targeted distribution of 1,000 jobs noted below.

Table 19 Distribution of 1,000 Jobs Across Maine Target Industries

NAICS	Target Industries	Jobs
221	Utilities	8
230	Construction	58
312	Beverage and tobacco product manufacturing	4
325	Chemical manufacturing	19
326	Plastics and rubber products manufacturing	10
332	Fabricated metal products manufacturing	15
333	Machinery manufacturing	10
334	Computer and electronic products manufacturing	10
335	Electrical equipment and appliance manufacturing	10
336	Transportation equipment manufacturing	19
339	Miscellaneous manufacturing	10
481	Air transportation	19
484	Truck transportation	4
485	Transit and ground passenger transportation	6
487	Scenic and sightseeing transportation and support services	27
512	Motion picture and sound recording industries	19
518	ISPs, search portals, data processing & Other Info Services	115
541	Professional, Scientific and Tech Services	77
561	Administrative and support services	58
562	Waste management and remediation services	4
621	Ambulatory health care services	123
622	Hospitals	173
623	Nursing and residential care facilities	46
624	Social assistance	46
710	Arts, Entertainment and Recreation	19
720	Accommodation and Food Service	92
	Total	1,000

Source: PDI analysis of DOL employment projections

Table 20 presents a summary of the total impact of achieving this 1,000 job target.

Table 20 Total Economic Impact on Maine of 1,000 Targeted Jobs

Activity	Sales	Jobs	Income	Avg. per Job
Direct Impact	$195,400,000	1,000	$58,400,000	$58,300
Indirect Impact	$65,700,000	470	$21,200,000	$45,300
Induced Impact	$67,400,000	590	$21,900,000	$36,900
Total Impact	$328,500,000	2,060	$101,500,000	$49,200
Multiplier	1.7	2.6	1.7	n.a.

Source: IMPLAN Pro 3 0 operated by Planning Decisions, Inc

The creation of 1,000 jobs targeted as indicated above will produce sales for Maine businesses of approximately $195 million and, at current average salaries for workers across all the targeted industries ($58,300), income of approximately $58 million.

Any portion of this $195 million not spent outside Maine becomes sales revenue to other Maine businesses throughout the state. Progressive rounds of spending by businesses with supply-chain relationships to the original target industries generate an additional $65.7 million in sales supporting 470 jobs earning just over $21 million in income. This constitutes the indirect impact of the target industry group on the Maine economy.

Following the commercial connections of the target industries further, the spending of their employees and the employees of their indirectly related vendors adds up to sales of $67.4 million going to Maine consumer businesses. This constitutes the induced impact on the Maine economy of the target industry group. It supports an additional 590 Maine jobs earning wages of nearly $22 million. The largest impacts here are in housing, health care, retail stores, restaurants and utilities.

Finally, all this sales, employment and income generate tax and fee income for Maine state and local governments. Table 11 summarizes the totals by category.

Table 21 State & Local Tax & Fee Revenue Generated by 1,000 Targeted Jobs

State Revenues	$9,100,000
Sales Taxes	$3,800,000
Income & Payroll Taxes	$4,200,000
Other State Taxes & Fees	$1,100,000
Local Revenues	$4,300,000
Property Taxes	$3,900,000
Other Local Taxes & Fees	$400,000
Total	$13,400,000

Source: IMPLAN Pro 3 0 operated by Planning Decisions, Inc

Adding these impacts together provides a measure of the total economic impact on Maine of the target industry group. They are:

- Total sales for Maine businesses of nearly $330 million;
- Total employment in Maine of nearly 2,100 jobs;
- Total income for Maine workers of over $100 million; and
- Total state and local tax and fee revenue of over $13 million.

Most importantly, these impacts will continue, year after year, as long as the 1,000 targeted jobs remain filled. In actual fact, each year, as workers grow more experienced and productive, these impacts should increase.

APPENDIX ONE

Table A1-1: Detail for Healthcare Oriented SOC's Relevant to Midcoast Campus

SOC Code	Occupation Description	Number of Jobs	Required Degree	Avg. Wage, 2009
19-1012	Food Scientists and Technologists	1	Bachelor's degree	1
19-1013	Soil and Plant Scientists	1	Bachelor's degree	1
19-1021	Biochemists and Biophysicists	8	Bachelor's degree	8
19-1022	Microbiologists	7	Doctoral degree	7
19-1023	Zoologists and Wildlife Biologists	2	Bachelor's degree	2
19-1029	Biological scientists, All other	4	Bachelor's degree	4
19-1042	Medical Scientists, Except Epidemiologists	29	Doctoral degree	29
19-1099	Life scientists, All other	2	Master's degree	2
19-2012	Physicists	3	Doctoral degree	3
19-2021	Atmospheric and Space Scientists	1	Bachelor's degree	1
19-2031	Chemists	25	Bachelor's degree	25
19-2032	Materials Scientists	2	Bachelor's degree	2
19-2041	Environmental Scientists,Specialists, Including Health	12	Master's degree	12
19-2042	Geoscientists, Except Hydrologists and Geographers	4	Master's degree	4
19-2043	Hydrologists	1	Master's degree	1
19-2099	Physical Scientists, All other	3	Master's degree	3
19-3011	Economists	1	Master's degree	1
19-3021	Market Research Analysts	50	Bachelor's degree	50
19-3022	Survey Researchers	4	Bachelor's degree	4
19-3031	Clinical, Counseling, and School Psychologists	24	Doctoral degree	24
19-3039	Psychologists, All Other	2	Master's degree	2
19-3099	Social Scientists and Related Workers, All other	7	Master's degree	7
19-4011	Agricultural and Food Science Technicians	1	Associate's degree	1
31-1012	Nursing Aides, Orderlies, and Attendants	712	Postsecondary vocational training	$23,060
31-1011	Home Health Aides	436	Short-term on-the-job training	$21,640
29-2061	Licensed Practical and Licensed Vocational Nurses	354	Postsecondary vocational training	$38,140
31-9092	Medical Assistants	275	Moderate-term on-the-job training	$28,340
31-9091	Dental Assistants	158	Moderate-term on-the-job training	$34,200
29-2034	Radiologic Technologists and Technicians	145	Associate's degree	$51,640
21-1093	Social and Human Service Assistants	112	Moderate-term on-the-job training	n a
29-2011	Medical and Clinical Laboratory Technologists	107	Bachelor's degree	$51,000
29-2071	Medical Records, Health Information Technicians	100	Associate's degree	$30,000
31-9099	Healthcare Support Workers, All other	99	Short-term on-the-job training	$25,780
29-2021	Dental Hygienists	95	Associate's degree	$62,420
29-2012	Medical and Clinical Laboratory Technicians	92	Associate's degree	$37,260
29-2041	Emergency Medical Technicians and Paramedics	92	Postsecondary vocational training	$29,040
25-9041	Teacher Assistants	69	Short-term on-the-job training	$37,466
29-2055	Surgical Technologists	65	Postsecondary vocational training	$38,600
29-2052	Pharmacy Technicians	52	Moderate-term on-the-job training	$26,780
31-9094	Medical Transcriptionists	48	Postsecondary vocational training	$31,400
29-2099	Health Technologists and Technicians, All other	47	Postsecondary vocational training	$38,660
31-2021	Physical Therapist Assistants	37	Associate's degree	$40,700
29-2032	Diagnostic Medical Sonographers	36	Associate's degree	$63,300
29-2031	Cardiovascular Technologists and Technicians	35	Associate degree	$50,640
29-2053	Psychiatric Technicians	34	Postsecondary vocational training	$27,200
31-9093	Medical Equipment Preparers	32	Short-term on-the-job training	$27,500
31-1013	Psychiatric Aides	31	Short-term on-the-job training	$27,980
29-9099	Healthcare Practitioners,Technical Workers, All other	28	Bachelor's degree	$54,560
31-2022	Physical Therapist Aides	26	Short-term on-the-job training	$24,120
19-4031	Chemical Technicians	23	Associate's degree	$37,080
29-2056	Veterinary Technologists and Technicians	20	Associate's degree	$28,640
29-2081	Opticians, Dispensing	19	Long-term on-the-job training	$31,260
31-9096	Veterinary Assistants, Laboratory Animal Caretakers	18	Short-term on-the-job training	$26,200
29-2033	Nuclear Medicine Technologists	15	Associate's degree	$65,100
19-4021	Biological Technicians	14	Bachelor's degree	$38,360
31-2011	Occupational Therapist Assistants	14	Associate's degree	$31,940
29-2051	Dietetic Technicians	13	Postsecondary vocational training	$27,520
31-9011	Massage therapists	12	Postsecondary vocational training	n a
25-3021	Self-Enrichment Education Teachers	11	Work experience in related occupation	$28,920
29-2054	Respiratory Therapy Technicians	11	Postsecondary vocational training	$45,120
19-4099	Life, Physical, Social Science Technicians, All other	9	Associate's degree	$46,140
29-9011	Occupational Health and Safety Specialists	8	Bachelor's degree	$60,580
19-4091	Environmental Science and Protection Technicians	5	Associate's degree	$32,380
29-9091	Athletic Trainers	4	Bachelor's degree	$46,140
31-2012	Occupational Therapist Aides	4	Associate's degree	n a
25-3011	Adult literacy, remedial education, GED Teachers	3	Work experience in related occupation	n a
31-9095	Pharmacy Aides	3	Short-term on-the-job training	$21,000
29-9012	Occupational Health and Safety Technicians	2	Associate's degree	n.a.
	Total	3,525		

APPENDIX TWO

List of Potential Job Growth in Target Industries by Occupational (SOC) Code and Instructional (CIP) Code

Table A2-1: CIP #11 Computer and Information Sciences and Support Services

SOC Code	Occupation	Total Job Demand	Educational Requirement	Wages, 2009
15-1051	Computer Systems Analysts	293	Bachelor's degree	$67,200
15-1041	Computer Support Specialists	234	Associate's degree	$40,620
15-1031	Computer Software Engineers, Applications	222	Bachelor's degree	$62,780
15-1032	Computer Software Engineers, Systems Software	203	Bachelor's degree	$79,660
15-1021	Computer Programmers	180	Bachelor's degree	$53,740
13-1199	Business Operations Specialists, All other	168	Bachelor's degree	$55,760
15-1071	Network and Computer Systems Administrators	138	Bachelor's degree	$57,540
15-1081	Network Systems and Data Communications Analysts	108	Bachelor's degree	$60,300
43-9011	Computer Operators	96	Moderate-term on-the-job training	$29,560
15-1099	Computer Specialists, All other	51	Associate's degree	$64,960
15-1061	Database Administrators	49	Bachelor's degree	$66,460
17-2061	Computer Hardware Engineers	25	Bachelor's degree	$68,300
51-4012	Numerical Tool and Process Control Programmers	10	Work experience in a related occupation	$43,900
	Total	1,777		

Table A2-2: CIP #48 Precision Production

SOC Code	Occupation	Total Job Demand	Educational Requirement	Wages, 2009
51-2092	Team Assemblers	241	Moderate-term on-the-job training	$31,280
51-1011	First-Line Supervisors/Managers of Production and Operating Workers	113	Work experience in a related occupation	$52,760
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	95	Moderate-term on-the-job training	$31,780
43-5061	Production, Planning, and Expediting Clerks	86	Moderate-term on-the-job training	$42,580
51-4121	Welders, Cutters, Solderers, and Brazers	78	Postsecondary vocational training	$34,300
51-4041	Machinists	71	Long-term on-the-job training	$38,200
51-2099	Assemblers and Fabricators, All other	65	Moderate-term on-the-job training	$23,660
49-1011	First-Line Supervisors/Managers of Mechanics, Installers, and Repairers	50	Work experience in a related occupation	$51,140
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	47	Moderate-term on-the-job training	$28,460
51-9199	Production Workers, All other	44	Moderate-term on-the-job training	$28,120
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	40	Moderate-term on-the-job training	$37,800
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	38	Moderate-term on-the-job training	$38,240
39-1021	First-Line Supervisors/Managers of Personal Service Workers	37	Work experience in a related occupation	$31,320
41-9238	Industrial Production Managers	34	Work experience in a related occupation	n a
47-2211	Sheet Metal Workers	33	Long-term on-the-job training	$35,740
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	32	Moderate-term on-the-job training	$39,320
41-1012	First-Line Supervisors/Managers of Non-Retail Sales Workers	28	Work experience in a related occupation	$58,940
49-9051	Electrical power-line installers and repairers	28	Long-term on-the-job training	n.a.
51-2041	Structural Metal Fabricators and Fitters	27	Moderate-term on-the-job training	$37,960
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	26	Moderate-term on-the-job training	$29,560
51-8091	Chemical Plant and System Operators	24	Long-term on-the-job training	$48,900
47-2011	Boilermakers	22	Long-term on-the-job training	$30,240
51-4023	Rolling machine setters, operators, and tenders, metal and plastic	22	Moderate-term on-the-job training	n.a.
51-4081	Multiple machine tool setters, operators, and tenders, metal and plastic	22	Long-term on-the-job training	$0
51-4111	Tool and Die Makers	21	Long-term on-the-job training	$49,000
51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	21	Moderate-term on-the-job training	$43,860
47-2132	Insulation Workers, Mechanical	19	Moderate-term on-the-job training	$35,840
51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	19	Moderate-term on-the-job training	$39,460

SOC Code	Occupation	Total Job Demand	Educational Requirement	Wages, 2009
51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	17	Moderate-term on-the-job training	$29,980
51-4034	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic	12	Moderate-term on-the-job training	$32,860
51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	12	Postsecondary vocational training	$38,840
51-5023	Printing Machine Operators	11	Moderate-term on-the-job training	$32,620
51-8013	Power Plant Operators	11	Long-term on-the-job training	$52,460
51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	11	Moderate-term on-the-job training	$34,680
53-1021	First-Line Supervisors/Managers of Helpers, Laborers, and Material Movers, Hand	11	Work experience in a related occupation	$36,660
51-2031	Engine and other machine assemblers	10	Moderate-term on-the-job training	$28,560
51-4199	Metal Workers and Plastic Workers, All Other	10	Moderate-term on-the-job training	$36,460
51-4022	Forging Machine Setters, Operators, and Tenders, Metal and Plastic	9	Moderate-term on-the-job training	$33,840
51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	9	Moderate-term on-the-job training	$33,580
51-5022	Prepress Technicians and Workers	9	Postsecondary vocational training	$30,460
17-3012	Electrical and Electronics Drafters	8	Postsecondary vocational training	$49,820
49-9044	Millwrights	8	Long-term on-the-job training	$43,820
51-2091	Fiberglass Laminators and Fabricators	7	Moderate-term on-the-job training	$31,720
51-9022	Grinding and Polishing Workers, Hand	7	Moderate-term on-the-job training	$33,240
51-9196	Paper Goods Machine Setters, Operators, and Tenders	7	Moderate-term on-the-job training	$39,560
51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic	6	Moderate-term on-the-job training	$43,880
51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	6	Moderate-term on-the-job training	$34,920
51-9141	Semiconductor processors	6	Moderate-term on-the-job training	n a
33-1099	First-Line Supervisors/Managers, Protective Service Workers, All Other	5	Work experience in a related occupation	$44,300
51-4035	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic	5	Moderate-term on-the-job training	$36,580
51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	5	Moderate-term on-the-job training	$37,260
39-1011	Gaming Supervisors	4	Work experience in a related occupation	$39,240
51-4051	Metal-refining Furnace Operators and Tenders	3	Long-term on-the-job training	$0
51-4192	Lay-Out Workers, Metal and Plastic	3	Moderate-term on-the-job training	$45,260
51-9021	Crushing, grinding, and Polishing Machine Setters, Operators, and Tenders	3	Moderate-term on-the-job training	n.a.

SOC Code	Occupation	Total Job Demand	Educational Requirement	Wages, 2009
51-9071	Jewelers and Precious Stone and Metal Workers	3	Postsecondary vocational training	$33,280
51-9194	Etchers and engravers	3	Moderate-term on-the-job training	$0
49-9069	Precision Instrument and Equipment Repairers, All other	2	Moderate-term on-the-job training	$43,060
51-4062	Patternmakers, Metal and Plastic	2	Long-term on-the-job training	n a
51-4194	Tool Grinders, Filers, and Sharpeners	2	Moderate-term on-the-job training	$31,600
51-7011	Cabinetmakers and Bench Carpenters	2	Long-term on-the-job training	$36,220
51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing	2	Moderate-term on-the-job training	$25,600
51-9051	Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders	2	Moderate-term on-the-job training	$33,480
51-9192	Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders	2	Moderate-term on-the-job training	$23,080
51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	2	Moderate-term on-the-job training	$25,760
51-2093	Timing device assemblers, adjusters, and calibrators	1	Moderate-term on-the-job training	$27,440
51-7041	Sawing Machine Setters, Operators, and Tenders, Wood	1	Moderate-term on-the-job training	$26,920
51-7099	Woodworkers, All other	1	Moderate-term on-the-job training	$33,760
51-9191	Cementing and Gluing Machine Operators and Tenders	1	Moderate-term on-the-job training	$25,420
51-9193	Cooling and Freezing Equipment Operators and Tenders	1	Moderate-term on-the-job training	$27,660
	Total	1,625		

APPENDIX THREE
List of Individuals Interviewed for this Project

Steve Adams	Jobs for the Future
Gene Ardido	President, Cport Credit Union
Joel Austin	Director of the Bath Technical Center
Mike Bourret	Executive Director of the Coastal Counties Workforce Investment Board
Tom Brubaker	Director of Energy Programs, Midcoast Regional Redevelopment Authority
Dan Conners	Connecticut Center for Advanced Technology
Peter Del Greco	Vice-President, Maine & Co.
John Dorrer	Former Director, Jobs for the Future, Maine Department of Labor, Center for Workforce Research & Information
Doug Drew	Guidance Counselor, Portland High School, Head of Career Pathways Program
Michael Dubyak	CEO, Wright Express
Jeremy Fisher	Chairman of Education Committee, Portland Regional Chamber
Diane Giddings	Human Resources Learning Center, L.L.Bean,
Gary Higginbottom	Maine Hydrogen Energy Center
Dana Humphries	Dean, College of Engineering, University of Maine
Matt Jacobson	President, Maine & Co.
Stacie Johnson	Talent & Development Learning Manager, L.L.Bean,
Angel Kimball	Assistant Director, Maine Manufacturers Association
Joe Kumiszcza	Technology Association of Maine
Steve Levesque	Executive Director, Midcoast Regional Redevelopment Authority
David Lyman	Creative Director, IDEAS4Maine
Jorge Maderal	Maine Hydrogen Energy Center
Lisa Martin	Executive Director, Maine Manufacturers Association
Jim McGowan	Director, Maine Quality Centers
Perry Newman	Atlantica, Inc.
Chris Pinkham	President, Maine Bankers Association
Neal Prescott	Managing Director, Novatec Braids Ltd.
Nancy Trottier	Events Director, Portland Regional Chamber
John Voltz	Strategy | Finance | Technology Commercialization
Steve Von Vogt	Executive Director, Maine Composites Alliance
Lawrence Wold	State President (Maine), TD Bank
Bob Wiemont	SMCC Bath Campus