



2016

EVALUATION AND ECONOMIC IMPACT OF THE MONTANA MANUFACTURING EXTENSION CENTER



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EXECUTIVE SUMMARY

The Montana Manufacturing Extension Center (MMEC) works with manufacturers to grow, innovate and become more profitable. MMEC employees typically make on-site visits to manufacturing clients to assess the problems, suggest appropriate solutions and assist with implementation.

MMEC closely monitors its performance by welcoming feedback and carefully following an evaluation procedure developed by the National Institute of Standards and Technology (NIST).

Clients are surveyed six months after a project is completed and asked about their satisfaction with the services they received. The respondents are also asked to quantify certain economic impacts and outcomes associated with the MMEC project. This report summarizes the surveys completed in 2016.

NIST has developed a standardized questionnaire and specifies when manufacturing clients are to be interviewed. This is the eighth year that this evaluation procedure has been used to gather data. Responses may be compared for the entire 2009-2016 period. The survey findings are as follows:

- ▶ Montana manufacturing clients were very satisfied and would very likely recommend MMEC to other firms.
- ▶ About 54 percent of the respondents said they relied exclusively on MMEC as a business service provider. This percentage declined from 2009 to 2013, but then reversed in 2014 and has been relatively stable since. There is no statistical difference between percentages reported for 2014 to 2016.
- ▶ The professionalism and knowledge of the MMEC staff continues to be the major strength of the center and several of the evaluations enthusiastically mentioned specific staff members.
- ▶ The 2016 Net Promoter Score (NPS), a quantitative measure of satisfaction, was calculated to be 86. The 2016 value for NPS was the second highest since calculations began in 2009.
- ▶ The most important challenges facing surveyed MMEC clients were ongoing continuous improvement/cost reduction strategies, identifying growth opportunities and product innovation/development.
- ▶ The perceived challenges mentioned by MMEC clients have changed over the eight years in which this survey has been conducted, perhaps reflecting the different phases of the business cycle. Cost reductions, product innovation and identifying growth opportunities ranked high during the entire 2009 to 2016 period. Personnel issues (employee recruitment and retention) have risen as the labor market has tightened. Fewer respondents are mentioning financing as a challenge as the economic recovery strengthens.
- ▶ The most often reported outcome mentioned in the 2016 surveys was an increased investment in plant/equipment. Second place was a tie between increased investments in workforce/employee skills and cost savings.
- ▶ Quantitative estimates of the outcomes of MMEC visits are volatile from one year to the next. The only consistent pattern were significant increases after recession lows in 2009. Thereafter, sizable increases and decreases alternated from one year to the next within each outcome category, with no discernible pattern.
- ▶ The 2016 survey respondents said that the MMEC visits resulted in 405 new and retained manufacturing jobs and directly or indirectly added approximately \$2,128,300 to Montana Individual Income Tax revenue.
- ▶ The Montana return on investment (ROI) for the MMEC during 2016 was 6.5 to 1. The state received about \$6.55 in income tax revenue for each dollar invested in MMEC.

MONTANA MANUFACTURING EXTENSION CENTER

The Montana Manufacturing Extension Center (MMEC) is the state's affiliate to the National Institute of Standards and Technology (NIST) Hollings Manufacturing Extension Partnership. The mission of the MMEC is to grow Montana's economy by helping manufacturers succeed.

MMEC provides a variety of services – from innovation and business management strategies to process improvements – and works with manufacturers to attract new customers, develop new products and expand into new markets.

MMEC is located in the College of Engineering at Montana State University. The MMEC director and the administrative offices are located in Bozeman. There are five field offices across the state: Missoula, Kalispell, Great Falls, Helena, Billings and Bozeman. Each office is staffed by a business advisor who works directly with the manufacturing clients in the area and connects them to additional business services. The Billings office was re-opened in 2015, after being closed due to budgetary factors. Paddy Fleming continues as the director of MMEC.

The core strength of MMEC is its employees. They are experienced, committed to Montana and knowledgeable about all aspects of manufacturing. MMEC business advisors interact directly with manufacturing clients and bring a wealth of expertise, tools and techniques to help solve the production, technical and management issues facing companies today. MMEC specialists travel to the manufacturing workplace to observe and evaluate problems, and then collaborate with management and staff to develop workable, cost-effective solutions consistent with the company goals.

MMEC hosts a "Compete Smart" statewide biennial conference for manufacturers and other interested parties, which offers an opportunity for learning and networking with peers, suppliers and colleagues. This conference also showcases many diverse manufactured goods from across Montana.



THE EVALUATION PROCESS

The MMEC evaluation process follows the guidelines developed by NIST as part of its management information reporting procedures. NIST specifies the timing of the evaluation and provides a standardized questionnaire distributed to manufacturing firms served by the MMEC. An analysis of the surveys and a written report are provided by an independent analyst.

Manufacturing clients are asked to evaluate the effectiveness of the MMEC and to quantify the economic impact of the MMEC's activities on their business and its effects on the Montana economy. The MMEC sent the independent analyst preparing this report 56 questionnaires for the 2016 evaluation period. After careful review, four were judged to be incomplete or otherwise unusable because of the large number of questions unanswered. Consequently, there were 52 questionnaires in the 2016 evaluation. This is the largest sample size since evaluations began and is well above the range of 41 to 47 completed questionnaires from 2009 to 2015. Also noteworthy is the decline in "item nonresponse," where individual questions were unanswered. Increased training and managerial focus are responsible for the improved data quality.

This is the eighth year that the evaluation process utilized the same questionnaire and timing. Earlier data from 2009 to 2015 evaluations are presented in many of the following tables. This allows identification and analysis of trends in the evaluation metrics.

OVERALL SATISFACTION

Manufacturing clients said they relied heavily on the MMEC and were very satisfied with the services received. In 2016, about 54 percent of the respondents said they relied exclusively on the MMEC and did not consult with any other provider of business performance services.

Between 2009 and 2013, there had been a trend toward using additional providers. As reported in Table 1 (page 7), the percentage of respondents who said they relied only on the MMEC dropped from 68 percent to 37 percent from 2009 to 2013. The 2014 to 2016 values suggest this downward trend has reversed and the percentage of respondents relying only on the MMEC has stabilized in the 54 percent to 56 percent range.

Montana manufacturers were asked if they would recommend the MMEC to other potential clients. They were asked to rate the likelihood of a positive recommendation, with one being the least likely and 10 being the most likely. As shown in Table 2 (page 7), about 72 percent of the 2016 respondents chose 10 (the most likely), approximately 16 percent chose nine, and 8 percent chose eight. About 2 percent of the respondents chose a value of seven or less.

The Net Promoter Score (NPS) is calculated by subtracting the percentage of respondents choosing one to six from the percentage choosing nine and 10. MMEC's 2016 NPS is 86 (88 percent - 2 percent = 86). The NPS values for 2009 to 2016 are presented in Table 3 (page 7). From 2009 to 2013 there was a consistent upward trend in the NPS. The value fell sharply to 79 in 2014 and then turned upward in 2015 and 2016. As shown in Table 2, the decline in 2014 may be traced to a 10 percent drop in respondents giving the MMEC a 10 rating – perhaps due to the closing of the Billings office. The percentage of respondents awarding a 10 in 2015 jumped to 83 percent, an all-time high. The percentage of respondents giving a 10 in 2016 dropped to 72 percent, but 16 percent selected a nine, yielding the second highest NPS of 86. Overall, the increasing NPS in 2015 and 2016 suggests that the MMEC has overcome its minor decline in measured satisfaction from 2014.

Table 1. Have you used any other external providers for business performance services?

Year	Yes	No	No Response
2009	32%	68%	-
2010	36%	62%	2%
2011	42%	58%	-
2012	52%	48%	-
2013	63%	37%	-
2014	46%	54%	-
2015	44%	56%	-
2016	46%	54%	-

Table 2. How likely would you be to recommend MMEC to other clients?

Year	Not Likely ----- Very Likely									
	1	2	3	4	5	6	7	8	9	10
2009	-	3%	-	-	3%	-	-	10%	18%	66%
2010	-	-	-	-	2%	2%	4%	4%	17%	71%
2011	-	-	-	-	-	-	2%	14%	12%	72%
2012	-	-	-	-	2%	-	5%	7%	10%	76%
2013	-	-	-	-	-	-	4%	4%	9%	82%
2014	-	-	-	-	5%	-	2%	9%	11%	73%
2015	-	-	-	-	3%	-	2%	10%	2%	83%
2016	-	-	-	-	-	2%	2%	8%	16%	72%

Table 3. Net Promoter Score (NPS) 2009 to 2016.

Year	NPS
2009	78
2010	84
2011	84
2012	84
2013	91
2014	79
2015	82
2016	86

Note: Net Promoter Score is calculated by subtracting the percentage of respondents choosing one to six from the percentage choosing nine and 10 as reported in Table 2.

CLIENT COMMENTS

The NIST questionnaire provides a number of opportunities for Montana manufacturers to provide suggestions and comments to the MMEC. These responses were edited slightly to preserve anonymity and were grouped by topic. They are presented in Table 4 (pages 8 and 9). These comments are overwhelmingly complimentary, and those about the professionalism and

abilities of the MMEC staff verify the findings reported in the next section concerning the primary reason why clients chose the MMEC. As in the past, respondents made several specific suggestions concerning ways in which the MMEC may further tailor its services in the future.

Table 4. Comments from respondents.

Professionalism and Relevance
Excellent resource for our community. We look forward to continuing our partnership with MMEC.
MMEC does a very good job relaying information about the services available to clients on an ongoing basis. Very well informed group.
Very good service.
Thank you for the work you do.
MMEC is a great partner for Montana manufacturers.
Thanks for all the help!
MMEC is fantastic to work with and a valuable partner to our business.
We would use their services again as needed.
I have recommended their services to another company.
Looking forward to working with you on the next stage of managerial processing.
It's stated and advertised that there is a lot of community type help available for small businesses in Montana. We've filled out a lot of applications and met with a lot of people. MMEC is the only one that has really stepped up to help and deliver. The support is not only very inexpensive, its on-going practical and beneficial. The staff never helps begrudgingly – they genuinely want to help you be successful.
Knowledgeable and Helpful Employees
We had a very good experience and Mark was a great project coordinator, and in the end we finished all the projects we started with UTAP.
Alistair did a great job getting our entire team involved in the training process. Very engaging and beneficial for all who attended.
I look forward to working with Bill and his team on several upcoming projects.
My survey answers have nothing to do with the excellent help and advice received from MMEC or Todd Daniels. Had our company truly listened and applied what was offered I believe we would have been way better off.
We very much appreciate the assistance we get from MMEC. They are a valuable resource for us and well worth the funding they receive.
After getting the report we requested from MMEC, our business went in a different direction and the info we learned was never put into practice. It was no fault of MMEC.

Table 4. Continued.

Suggestions for the MMEC

Create local networking groups of manufacturers. Communicate with other MEP centers to find solutions to manufacturers' challenges and new services to offer. Devote more time to evaluating and understanding individual manufacturers' needs.

Need to be more directly helpful.

Your questionnaire does not ask the right questions and limits the answers. Are you sure you are asking the right questions that matter to small businesses? There seems to be a disconnect here.

The recent improvements and expansion of services and scope of MMEC is much appreciated.

Lack of manufacturing resources (in Montana) through newsletters and/or publications. It would be nice to know who does what in the manufacturing field in Montana and adjacent states.

Other Comments

My company was a startup when MMEC first came out to help us set up our shop. The processes and equipment layout provided greatly increased our flexibility and efficiency.

We are in the process of building a new crush plant that will begin in 2017.



WHY MMEC WAS CHOSEN

The NIST questionnaire provided eight reasons for choosing the MMEC and respondents were asked to identify the two most important. These responses are reported in Table 5 (page 10). About 69 percent of the respondents mentioned the expertise of the MMEC as the most important reason. The 2016 figure is down somewhat from the 85 percent mentioned in 2015, but staff expertise was still by far the most often mentioned reason for choosing the MMEC.

Three factors were tied for second place at 29 percent; reputation for results, fair and unbiased advice/services and cost/price of services. The least mentioned reasons were the lack of other providers and the unavailability of services, the former mentioned by only 8 percent of the respondents and the latter by 10 percent.

The 2016 responses are similar to those for 2009 to 2015. The rank in order of reasons for choosing the MMEC have remained relatively constant, with only a minor switch between second through fifth places. Staff expertise has been in first place all eight years. The figure rose to an all-time high of 85 percent of respondents in 2015. The 29 percent figure for fair and unbiased advice/services reported in 2016 is higher than any other year except 2009.

Table 5. Important factors for your firm choosing MMEC.

Factor	Percent Mentioning								Order (2016)
	2009	2010	2011	2012	2013	2014	2015	2016	
Staff Expertise	55	81	62	71	80	80	85	69	1
Reputation for Results	29	26	33	33	24	33	29	29	2
Fair and Unbiased Advice/Services	34	19	22	19	22	24	20	29	3
Cost/Price of Services	32	28	29	26	33	22	17	29	4
Knowledge of Your Industry	16	11	18	26	26	22	24	17	5
Specific Services Not Otherwise Available	16	6	7	12	4	7	10	10	6
Lack of Other Providers Nearby	7	9	7	2	9	4	7	8	7

FUTURE CHALLENGES

The NIST questionnaire provided two opportunities for the respondents to identify future challenges they may face. The first opportunity instructed respondents to pick three of nine categories of potential future challenges and the second was an open-ended question.

As shown in Table 6 (page 11), the most often mentioned future challenges were ongoing continuous improvement/cost reduction strategies (65 percent). Identifying growth opportunities was second (60 percent) and product innovation/development (56 percent) was third. The least mentioned were exporting/global engagement (8 percent) and sustainability in products and processes (8 percent).

The challenges businesses mentioned changed over the course of the Great Recession and the long slow recovery. Cost reductions, product innovation and identifying growth opportunities consistently ranked among the top challenges during the entire period, indicating they are viewed as important throughout the business cycle. There are several challenges that

rose or declined in importance over the business cycle. Personnel issues (employee recruitment and retention) has been consistently climbing since 2009 and ranked No. 4 in 2016. This may reflect the tightening labor market. Similarly, there were fewer and fewer respondents mentioning financing as a future challenge, perhaps because financial conditions have improved as the economic recovery strengthened. About 23 to 26 percent mentioned financing as a future challenge in 2009 and 2010, but this figure dropped to the 12 to 14 percent range in 2015 and 2016.

The NIST questionnaire also provided an open-ended question that allowed each respondent to identify challenges not on the list. There were no responses in 2016.

Table 6. Important future challenges facing your business.

Challenge	Percent Mentioning								
	2009	2010	2011	2012	2013	2014	2015	2016	Order (2016)
Ongoing Continuous Improvement/Cost Reduction Strategies	61	66	51	69	54	67	63	65	1
Identifying Growth Opportunities	42	47	40	64	52	53	41	60	2
Product Innovation/Development	53	51	49	59	59	40	56	56	3
Employee Recruitment and Retention	29	30	20	33	41	38	46	40	4
Technology Needs	16	8	4	10	15	20	7	19	5
Managing Partners and Suppliers	11	15	25	10	17	11	24	14	6
Financing	26	23	16	12	15	18	12	14	7
Sustainability in Products and Processes	18	13	24	14	15	16	22	8	8
Exporting/Global Engagement	17	19	9	12	9	13	10	8	9

OUTCOMES OF MMEC VISITS AND SERVICES

Ten potential outcomes of the MMEC visit were listed on the NIST questionnaire and Montana manufacturers were asked which were experienced by their firm. The tabulations of outcomes are presented in Table 7 (page 12).

The most reported outcome was increased investment in plant/equipment (50 percent). Second place was a tie between increased investment in workforce or employee skills and cost savings (both at 48 percent). At the lower end, increased investments in information systems or software and increased sales were both mentioned by 27 percent of respondents.

The eight years of survey data shed light on the changing pattern of outcomes of MMEC visits. Almost all of the outcome categories have ranked high or low at one time or another during the period. Table 8 (page 13) presents a tally of the years in which each ranked in the top four. Avoiding unnecessary investment ranked first for three years and second in another year. Retaining lost jobs also had four appearances in the top four rankings. All of the outcome categories ranked first to fourth during at least one year of this eight year period.

Table 7. Outcomes of MMEC visits and services.

Outcome	Percent Mentioning								Order (2016)
	2009	2010	2011	2012	2013	2014	2015	2016	
Increased investment in plant/equipment	53	57	57	60	58	44	53	50	1
Increased investment in workforce or employee skills	50	66	67	65	63	42	59	48	2
Cost savings realized	68	70	64	57	70	42	51	48	3
Retained otherwise lost jobs	50	53	60	55	63	56	53	44	4
Increased investments in other areas	34	45	48	43	42	24	46	44	5
Created new jobs	34	51	52	42	58	42	41	38	6
Retained otherwise lost sales	40	51	38	40	53	44	39	38	7
Avoided unnecessary investments	29	51	48	40	39	24	28	35	8
Increased sales	42	47	48	60	60	38	41	27	9
Increased investments in information systems or software	42	28	36	29	43	38	39	27	10



Table 8. Top outcome categories of MMEC visits and services.

Category	Rank #1	Rank #2	Rank #3	Rank #4
Workforce Investment	2015	2013, 2016	-	-
Retained Lost Jobs	2014	2015	2012	2016
Plant/equip. Investment	2016	2014	2015	-
Cost Savings	-	2009	2010, 2016	-
Other Investments	2011	-	2013, 2009	-
New Jobs	-	-	2012	-
Increased Sales	-	-	-	2013
Retained Lost Sales	2012	2014	-	-
Info Systems Investment	-	-	2013	-
Avoided Investments.	2009, 2010, 2013	2011	-	-

QUANTITATIVE ESTIMATES OF MMEC VISIT OUTCOMES

The NIST survey asked Montana manufacturers to quantify certain outcomes of the MMEC visit. They were asked the number of new and retained jobs, the amounts of cost savings, new and retained sales, capital and workforce investments and avoided unnecessary investments. Starting in 2009, the respondents were queried about four detailed investment categories.

As reported in Table 9 (page 15), the 2016 respondents said there were 405 new or retained jobs as a result of the MMEC visit. New and retained sales were about \$64.7 million. Cost savings totaled approximately \$4.6 million, and capital and workforce investments were roughly \$18.9 million. Avoided unnecessary investment totaled about \$1.8 million.

There are eight years of consistent data in Table 9 that could potentially reveal trends and/or cyclic patterns. Unfortunately, extreme year-to-year volatility in the outcome categories masks trends and other patterns. For example, the number of new and retained jobs dropped from 880 in 2011 to 440 in 2012 and then rebounded to 660 in 2013.

An examination of the responses revealed a number of cases where the value of estimated outcomes was dominated by a few (mostly one, but at most two very large) responses. These responses can skew time series analysis and obscure long-run trends. Consequently, there are two entries for each category starting with 2010. The first includes all responses as reported and the second excludes the distorting entries.

Unfortunately, the edited values are as volatile as the unedited ones. For example, the edited figures for new and retained jobs still bounce from 248 in 2013 to 168 in 2014 and then to 230 in 2015. Moreover, there is no correlation between the quantitative outcome categories. For example, the edited value for new and retained jobs was 280 in 2016, the second highest reported. At the same time the edited 2016 value for new and retained sales was only \$11.5 million, the lowest reported during the entire 2009 to 2016 period.

Rows five to 10 of Table 9 present detailed data for subcategories of capital and workforce investments and avoided unnecessary investments. These questions were added to the surveys beginning in 2009. The edited and unedited values for these four detailed categories display the same volatility as the major categories in the upper portion of the table. But all show significant increases from the recession lows in 2009.



Table 9. Quantitative estimates of MMEC visit outcomes.

	2008	2009	2010		2011		2012	
Economic Impact	-	-	As Reported	Edited	As Reported	Edited	As Reported	Edited
New and retained jobs	142	113	355	221	890	285	440	160
New and retained sales	\$23,460,000	\$8,870,000	\$170,562,000	\$30,562,000	\$231,940,000	\$31,939,800	\$200,262,916	\$25,262,916
Cost savings	\$2,240,000	\$2,200,000	\$13,462,900	\$3,462,900	\$21,809,100	\$1,326,300	\$7,669,722	\$1,921,722
Capital and workforce investments	\$6,410,000	\$3,494,740	\$29,489,900	\$12,214,940	\$20,347,000	\$18,694,000	\$30,304,549	\$10,560,197
Investment in plant/equipment	-	\$1,849,000	\$7,940,200	\$7,690,200	\$15,800,400	\$14,200,400	\$13,011,450	\$6,811,450
Investment in information systems or software	-	\$297,140	\$226,600	\$226,600	\$583,300	\$583,300	\$191,200	\$191,200
Investment in workforce practices or employee skills	-	\$320,600	\$718,700	\$693,700	\$459,600	\$406,600	\$789,311	\$676,579
Other investments	-	\$1,028,000	\$20,604,400	\$3,604,440	\$3,503,700	\$3,503,700	\$16,312,588	\$2,880,968
Avoided unnecessary investments	-	\$296,100	\$3,862,300	\$1,862,300	\$2,564,700	\$514,700	\$1,542,590	\$1,542,590

	2013		2014		2015		2016	
Economic Impact	As Reported	Edited	As Reported	Edited	As Reported	Edited	As Reported	Edited
New and retained jobs	660	248	453	168	388	230	405	280
New and retained sales	\$135,930,900	\$25,930,900	\$73,404,315	\$37,404,315	\$71,911,172	\$27,122,000	\$64,700,000	\$11,508,063
Cost savings	\$3,799,329	\$3,158,287	\$2,467,816	\$1,967,816	\$4,996,245	\$3,472,245	\$4,600,963	\$4,600,963
Capital and workforce investments	\$34,851,915	\$8,792,830	\$7,033,288	\$5,913,288	\$21,373,905	\$11,771,165	\$18,924,380	\$15,096,380
Investment in plant/equipment	\$2,719,400	\$2,709,400	\$858,800	\$838,800	\$4,448,000	\$4,448,000	\$4,930,500	\$4,930,500
Investment in information systems or software	\$744,150	\$744,150	\$349,000	\$349,000	\$304,000	\$214,000	\$498,850	\$488,850
Investment in workforce practices or employee skills	\$623,200	\$470,115	\$277,428	\$177,428	\$381,156	\$349,316	\$1,112,000	\$1,073,000
Other investments	\$30,765,165	\$4,869,165	\$5,548,060	\$4,548,060	\$16,240,749	\$6,759,849	\$12,383,030	\$8,604,030
Avoided unnecessary investments	\$1,154,000	\$154,000	\$1,252,958	\$1,252,958	\$796,000	\$796,000	\$1,276,000	\$1,276,000

	Total Five Years (2012-2016)	Since MMEC Inception (1996)
Economic Impact		
New and retained jobs	2,346	-
New and retained sales	546,209,303	\$1,155,481,303
Cost savings	23,534,075	\$87,176,075
Capital and workforce investments	112,488,037	\$206,704,937
Investment in plant/equipment	25,968,150	-
Investment in information systems or software	2,087,200	-
Investment in workforce practices or employee skills	3,183,095	-
Other investments	81,249,592	-
Avoided unnecessary investments	6,021,548	-

The one pattern that is present in all the outcome categories are sizable increases from recession lows and then stabilization within a range during post-recession years. For example, the value for new and retained sales

was \$8.9 million in the recession year 2009, but never dropped below \$25 million in the following years and stood at \$64.7 million in 2016. The ranges for the outcome categories are presented in Table 10 (page 16).

Table 10. The 2010 to 2016 ranges for edited values of the quantitative outcomes in each category are as follows:

Category	Range
New and retained jobs	160-285
New and retained sales	\$11-\$37 million
Cost savings	\$1.3-\$3.5 million
Capital and workforce investments	\$6-\$19 million
Investment in plant/equipment	\$0.8-\$14.2 million
Investment in information systems or software	\$190-\$750 thousand
Investment in workforce practices or employee skills	\$175 thousand-\$1.1million
Other investments	\$2.9-\$8.6 million
Avoided unnecessary investments	\$.15-\$1.9 million



ECONOMIC IMPACTS OF MMEC VISITS AND SERVICES

MMEC clients were queried about the number of new jobs created and the number of jobs retained as a result of the visit. The 2016 respondents said that there were 100 new jobs created and 305 jobs retained for a total of 405 jobs.

The preliminary data suggest that average wages for Montana manufacturing jobs were about \$48,300 in 2016. Total wages associated with the new and retained jobs were approximately \$19,561,500 ($405 \times \$48,300 = \$19,561,500$). Using an average tax rate of 4.0 percent, the new and retained workers paid approximately \$782,460 ($\$19,561,500 \times .04 = \$782,460$) in Montana Individual Income Taxes.

The Montana Department of Labor and Industry estimates that the employment multiplier of manufacturing is 3.58. This suggests that

about 2.58 new jobs will be created in other sectors as a result of one new manufacturing job. This agency also reports that the wage multiplier is 2.72, implying that an additional \$1.72 in wages is created elsewhere in the Montana economy for each \$1.00 in new manufacturing wages.

Calculations based on the employment and wage multipliers are reported in Table 11 (page 17). The 405 new and retained jobs associated with MMEC visits reported in 2016 led to a total of 1,450 ($405 \times 3.58 = 1,449.9$) new jobs in Montana and approximately \$53,208,100 ($\$19,561,500 \times 2.72 = \$53,208,100$) in statewide wages. Additional wages generated roughly \$2,128,300 ($\$53,208,100 \times .04 = \$2,128,360$) in Montana Individual Income Tax revenue.

Table 11. Economic impacts of MMEC services, 2016.

Sector	Jobs	Wages	Montana Individual Income Taxes
Manufacturing	405	\$19,561,500	\$782,460
Other Industries	1,045	\$33,646,600	\$1,345,900
Total	1,450	\$53,208,100	\$2,128,360

RETURN ON INVESTMENT AND FEES (ROI)

MMEC is a public-private partnership that is awarded \$512,000 annually from the National Institute of Standards and Technology with a match requirement. In 2016, MMEC matched the federal funds with \$325,000 from the state of Montana and \$521,000 in project fees that were charged to Montana manufacturers who requested MMEC services. The benefits of these investments may be estimated by calculating a return on investment (ROI) for each. The ROI for the state of Montana is calculated by comparing the estimated increase in Montana Individual Income Tax payments associated with the reported jobs created or saved due to the MMEC visit. The ROI for MMEC clients is estimated by comparing the cost savings, plus avoided unnecessary investment, plus a portion of the increase sales to the amount paid by clients.

As presented in Table 9 (page 15), MMEC clients reported \$4,600,954 in costs savings, \$1,276,000 in avoided unnecessary investments and \$64,700,000 in

new or retained sales. Assuming a modest 10 percent gross margin, the net gain to clients of the new or retained sales is \$6,470,000 ($0.1 \times \$64,700,000 = \$6,470,000$). Cost savings + avoided investments + gross margin associated with new and retained sales equals \$12,346,954 ($\$4,600,954 + \$1,276,000 + \$6,470,000 = \$12,346,954$). Based on the \$510,000 in fees paid by MMEC clients, their return on investment in 2016 was approximately 23.7 to 1 ($\$12,346,954 / \$521,000 = 23.69$). Therefore, the fees paid by MMEC clients provide them an excellent return.

As shown in Table 11 (page 17), MMEC projects generated approximately \$2,128,360 in Montana Individual Income taxes from both direct and indirect jobs. Based on \$325,000 calendar year funding for the MMEC, Montana's return on investment during 2016 was approximately 6.5 to 1 ($\$2,128,360 / \$325,000 = 6.55$). Therefore, the public dollars invested in MMEC provide Montanans an excellent rate of return.



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