2017 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 create and retain jobs, innovate, reduce costs, increase profits and save time and money. 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 complete and asked about their satisfaction with the services they received. These respondents are also asked to quantify certain economic impacts and outcomes associated with the MMEC project. This report summarizes the surveys completed in 2017.

NIST has developed a standardized questionnaire and specifies when manufacturing clients are to be interviewed. This is the ninth year that this evaluation procedure has been used to gather the data. Responses may be compared for the entire 2009-2017 period. The survey findings are as follows:

- Montana manufacturing clients were very satisfied and would be very likely to recommend MMEC to other firms.
- About 61 percent of the respondents said they relied exclusively on MMEC as a business service provider. This is the highest figure since 2010 and indicates growing confidence in MMEC. This percentage declined from 2009 to 2013, but reversed in 2014 and remained stable for three years, then increased in 2017.
- 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 2017 Net Promoter Score (NPS), a quantitative measure of satisfaction, was calculated to be 84. The 2017 value was down slightly from the 2016 value of 86, which was the second highest NPS 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 least mentioned were exporting/global engagement and technology needs.
- The perceived challenges mentioned by MMEC clients have changed over the nine years 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 2017 period. Personnel issues (employee recruitment and retention) have risen as the labor market tightens. Fewer respondents mentioned financing as a challenge as the economic recovery has strengthened.
- The most often reported outcome mentioned in 2017 was increased investments in workforce/employee skills. Second was increased investment in plant and equipment. Cost savings ranked high during each of the nine years analyzed, but the highest rankings occurred just as the Great Recession was ending during 2009-13.
- Quantitative estimates of the outcomes of MMEC visits are volatile from one year to the next. The only consistent pattern was that they all increased significantly 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 2017 survey respondents said that MMEC visits resulted in 397 new and retained manufacturing jobs and directly or indirectly added approximately $2,087,978 to Montana individual income tax revenue.
- The Montana return on investment (ROI) for MMEC during 2017 was about 6.4 to 1. The state received about $6.42 in income tax revenue for each dollar invested in MMEC.
- MMEC clients paid approximately $575,742 in fees during 2017. Their return on investment in 2017 was approximately 18.6 to 1.

MONTANA MANUFACTURING EXTENSION CENTER

The Montana Manufacturing Extension Center (MMEC) is the state's affiliate for the National Institute of Standards and Technology (NIST) Hollings Manufacturing Extension Partnership. The mission of MMEC is to work with Montana manufacturers to create and retain jobs, accelerate innovation, increase profits and save time and money.

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, Helena, Billings and Bozeman. Each office is staffed by a field engineer who works directly with 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 field engineers interact directly with manufacturing clients. They bring a wealth of expertise, tools and techniques with them 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 the diversity of manufactured goods from across Montana.

THE EVALUATION PROCESS

The MMEC evaluation process follows 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 MMEC. The analysis of the surveys and a written report are provided by an independent analyst.

Manufacturing clients are asked to evaluate the effectiveness of MMEC and to quantify the economic impact of MMEC's activities on their business and its effects on the Montana economy. MMEC sent the independent analyst preparing this report 54 questionnaires for the 2017 evaluation period. After careful review, two were judged to be incomplete or otherwise unusable because none of the questions were answered. Consequently, there were 52 questionnaires in the 2017 evaluation. The 2016 and 2017 evaluations were both based on 52 questionnaires completed. These questionnaires provided the largest sample sizes since the evaluations began and are 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 have been responsible for the improved data quality.

This is the ninth year that the evaluation process utilized the same questionnaire and timing. Earlier data from 2009 to 2016 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 MMEC and were very satisfied with the services received. In 2017, about 61 percent of the respondents said they relied exclusively on MMEC and did not consult with any other provider of business performance services.

Between 2009 and 2013, more and more respondents said they were using additional providers. As reported in Table 1, the percentage of respondents who said they relied only on MMEC dropped from 68 percent to 37 percent from 2009 to 2013. The 2014 to 2016 values were in the 54-56 percent range ending the downward trend. In 2017, about 61 percent of the respondents said they relied only on MMEC and not on other external providers. This is the highest figure recorded since 2009.

Montana manufacturers were asked if they would recommend 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 about 75 percent of the 2017 respondents chose 10 (the most likely), approximately 11 percent chose nine and 6 percent chose eight. About 8 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 2017 NPS is 84 (86 percent minus 2 percent equals 84). The NPS values for 2009 to 2017 are presented in Table 3. From 2009 to 2013 there was an upward trend in the NPS. The value fell sharply to 79 in 2014 and then turned upward and stabilized in the 82 to 86 range from 2015 to 2017. As shown earlier in Table 2, the decline in 2014 may be traced to the 10 percent drop in respondents giving 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 and 2017 dropped to the 72 to 75 percent range, but 11 to 16 percent selected the second highest rating of nine. Overall, the return of the NPS to the mid-80s range in 2015 to 2017 suggests that the MMEC has overcome the decline in measured satisfaction in 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%	-
2017	39%	61%	-

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

	Not likely									Very likely
Year	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%
2017	-	-	2%	-	-	-	6%	6%	11%	75%

Table 3. *Net Promoter Score (NPS) 2009 to 2017.*

Year	NPS
2009	78
2010	84
2011	84
2012	84
2013	91
2014	79
2015	82
2016	86
2017	84

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.

WHY MMEC WAS CHOSEN

The NIST questionnaire provided eight reasons for choosing MMEC and the respondents were asked to identify the two most important. These responses are reported in Table 4. About 87 percent of the respondents mentioned staff expertise of MMEC as the most important reason – the highest figure since the current questionnaire was established. Both the 2015 and 2017 values were in the mid-80s, suggesting that the 69 percent value for 2016 was an anomaly.

The second most important factor for firms choosing MMEC was knowledge of the respondents' industry. About 23 percent of the respondents mentioned this factor. Knowledge of a client's industry has risen significantly in recent surveys from a low of 11 percent in 2010. This increase may reflect greater efforts by MMEC employees to know and understand the needs of their clients.

Twenty-one percent of respondents mentioned fair and unbiased advice/services, placing it third. About 19 percent of the respondents mentioned MMEC's reputation for results as the reason they choose them, leading to the fourth ranked factor. The two least mentioned factors were specific services not otherwise available and the lack of other providers nearby.

The 2017 responses are very similar to those from earlier years. The rank orderings of the reasons for choosing MMEC have remained relatively constant with only a minor switching of second through fifth places. Staff expertise has been solidly in first place all nine years with the 2017 figure of 87 percent being the all-time high. The 29 percent figure for fair and unbiased advice/services continues to rank third, although its percentage declined slightly between 2016 and 2017.

Table 4. *Important factors for your firm choosing MMEC.*

	Percent mentioning									
Factor	2009	2010	2011	2012	2013	2014	2015	2016	2017	Order (2017)
Staff expertise	55	81	62	71	80	80	85	69	87	1
Knowledge of your industry	16	11	18	26	26	22	24	17	23	2
Fair and unbiased advice/services	34	19	22	19	22	24	20	29	21	3
Reputation for results	29	26	33	33	24	33	29	29	19	4
Cost/price of services	32	28	29	26	33	22	17	29	15	5
Specific services not otherwise available	16	6	7	12	4	7	10	10	15	6
Lack of other providers nearby	7	9	7	2	9	4	7	8	10	7

CLIENT COMMENTS

The NIST questionnaire provides a number of opportunities for Montana manufacturers to provide suggestions and comments to MMEC. These responses were edited slightly to preserve anonymity and grouped by topic. They are presented in Table 5. These comments are overwhelmingly complimentary and those about the professionalism and abilities of the MMEC staff verify the findings reported in the previous section concerning the primary reason why clients chose MMEC. As in the past, respondents made several specific suggestions concerning ways in which MMEC may further tailor its services in the future.

Table 5. *Comments from respondents.*

Professionalism and relevance
Great organization - critical to improving our business.
Our overall experience with MMEC has been exceptional. This year's project was an exception and was our only less than positive experience.
Please continue to offer awesome engineering services, as well as overall business management services!
MMEC has provided critical advice several times during the life of our company. The most important was helping us find competent manufacturers when we first opened.
MMEC plays a critical role for manufacturers in Montana, which is an isolated rural state with little access to other providers with the expertise that MMEC provides.
Keep up the good work and thanks for all your help over the years.
Great organization. I will have some additional projects this year that will require your assistance.
MMEC is the best kept secret for small- and medium-sized manufacturers (competency, value and ethics).
Excellent service!
Thank you for all your help!
Amazing knowledge and expertise! Excellent job working with us to find solutions and to teach us lasting concepts.
MMEC is a valuable resource for our company and any other growing company that needs great resources to understand operational efficiencies and growth opportunities. We strongly support continued and increased funding for MMEC and we plan to increase our investment in the center.
Keep up the good work. MMEC has a very good set of processes in place for business analysis and recommending plans for improvement. The Lean Manufacturing courses, resources and collaboration has helped us greatly.
We are so grateful for the services provided by MMEC. With their assistance in training on how to create SOP master documents, risk analysis and other fundamentals of our manufacturing process, our team developed the skills needed to bring our manufacturing from China to Montana. The services provided by MMEC are what have built a strong Montana manufacturing community. MMEC has created a great foundation for future business growth in the industry. I look forward to working with MMEC in the future on business improvements in our supply chain product development and cost analysis.

Table 5. *Continued.*

Professionalism and relevance
MMEC has been a great resource with vast knowledge in not only manufacturing but also business advice. They are a great contact that we are fortunate to have.
MMEC is my number one resource when I need assistance related to manufacturing and efficiency. They are growth and improvement minded and I feel my time with them, no matter the capacity, is always a benefit to the long term success of my business. Everything I have done with them has become the foundation to all other processes and has saved me more money and stress than I can ever put into numbers.
MMEC does a great job and is a fantastic asset for Montana.

Knowledgeable and helpful employees
Clone Claude Smith and send him out to all Montana manufacturers. He is an invaluable resource for our state.
You guys provide exceptional services that cannot be replaced by anyone else to my knowledge. Mark and everyone have been great over the years. Thank you for all of your assistance.
MMEC is an excellent resource for our company on many levels. Alistair, Jenni and others are always extremely responsive to requests for information assistance or referrals. Alistair in particular has really helped me as the business owner to think outside of simply surviving, but towards a future to ensure steady growth and preparation to eventually sell or transfer the business.
I think they did a fantastic job for us and would highly recommend. We are now just waiting for government contracts to come through.
This is my first experience with MMEC. I was unaware of it until I met Paddy Fleming. He was the man I needed to meet to get this project rolling.
They have been very helpful knowledgeable team players.

Suggestions for MMEC
Provide a database of other clients and the work they are doing to improve collaboration and learning between companies.
Need more grants. Your prices are fair. We simply need more money to invest.
Increase your marketing efforts.
Quicker turn around for quotes.
Provide more ISO training for MMEC staff to better assist businesses such as ours.
MMEC can improve by getting the word out and expanding their marketing of services.

Table 5. *Continued.*

Other comments
I don't feel that this survey is very accurate for the services that were provided most recently. The survey should be done for the most current services provided or over a year time frame. This survey is built upon services that were provided 10 years ago. Our business has changed significantly over that time frame and this survey does not accurately reflect that.
The main reason for setting up the ISO process for our company was based on a project that did not continue. We were on track to go into production on a motor design and the company we were working with canceled the project in the late stage of development. We do use the system/process for our engineering department for document and model control, but everything we do is prototype building for specific customers. Our control system is better, but certainly not being followed to the extent we originally intended. I cannot estimate dollars/time saved for what we do at this point.
Glad you are here and we hope to continue working with you.

FUTURE CHALLENGES

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

As shown in Table 6, the most often mentioned future challenges were ongoing continuous improvement/cost reduction strategies (57 percent). Identifying growth opportunities was second (50 percent) and product innovation/development was third (48 percent). The least mentioned were exporting/global engagement (10 percent) and technology needs (13 percent).

The challenges businesses mentioned changed over the course of the long, slow recovery from the Great Recession. 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 were several other challenges that rose or declined in importance over the business cycle. Personnel issues (employee recruitment and retention) has consistently climbed since 2009 and ranked #4 in 2017. This may reflect the tightening labor market. Similarly, there were fewer respondents who mentioned 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 the 12 to 14 percent range in 2016 and 2017.

The NIST questionnaire also provided an open-ended question that allowed each respondent to identify challenges not on the list. The two 2017 responses were “exit strategy” and “marketing.”

Table 6. *Important future challenges facing your business.*

	Percent mentioning									
Challenge	2009	2010	2011	2012	2013	2014	2015	2016	2017	Order (2017)
Ongoing continuous improvement/cost reduction strategies	61	66	51	69	54	67	63	65	57	1
Identifying growth opportunities	42	47	40	64	52	53	41	60	50	2
Product innovation/development	53	51	49	59	59	40	56	56	48	3
Employee recruitment and retention	29	30	20	33	41	38	46	40	44	4
Managing partners and suppliers	11	15	25	10	17	11	24	14	23	5
Sustainability in products and processes	18	13	24	14	15	16	22	8	17	6
Financing	26	23	16	12	15	18	12	14	14	7
Technology needs	16	8	4	10	15	20	7	19	13	8
Exporting/global engagement	17	19	9	12	9	13	10	8	10	9

OUTCOMES OF MMEC VISITS AND SERVICES

Ten potential outcomes of MMEC visits 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.

The most reported outcome was an increased investment in plant/equipment (62 percent). Second place was a tie between increased investment in plant/equipment and cost savings (both at 54 percent). At the lower end, increased investment in information systems or software was mentioned by 27 percent of the respondents and increased investments in other areas was mentioned by 31 percent of the respondents.

The nine years of survey data shed light on the changing pattern of outcomes of MMEC visits. Six of the nine outcome categories have consistently ranked high. Table 8 presents a tally of the years in which each category ranked in the top four. Workforce investment and cost savings received the most #1 rankings. Investments in plant and equipment and workforce investment received the most #2 rankings. The only outcomes not to rank in the top four were other investments, investments in information systems or software and avoided unnecessary investments.

Cost savings, workforce investment and plant/equipment investment were the most often mentioned outcomes of MMEC visits during the 2009 to 2017 period. Cost savings ranked first during the recovery from the Great Recession while workforce investments ranked higher in recent years, perhaps due to the tightening labor market.

Table 7. *Outcomes of MMEC visits and services.*

	Percent mentioning									
Outcome	2009	2010	2011	2012	2013	2014	2015	2016	2017	Order (2017)
Increased investment in workforce or employee skills	50	66	67	65	63	42	59	48	62	1
Increased investment in plant/equipment	53	57	57	60	58	44	53	50	54	2
Cost savings realized	68	70	64	57	70	42	51	48	54	3
Created new jobs	34	51	52	42	58	42	41	38	44	4
Retained otherwise lost sales	40	51	38	40	53	44	39	38	40	5
Increased sales	42	47	48	60	60	38	41	27	40	6
Retained otherwise lost jobs	50	53	60	55	63	56	53	44	39	7
Avoided unnecessary investments	29	51	48	40	39	24	28	35	37	8
Increased investments in other areas	34	45	48	43	42	24	46	44	31	9
Increased investments in information systems or software	42	28	36	29	43	38	39	27	27	10

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

Category	Rank #1	Rank #2	Rank #3	Rank #4
Workforce investment	2011, 2012, 2015, 2017	2010, 2013, 2016	2009	-
Retained lost jobs	2014	2015	2011, 2013	2009, 2010, 2016
Plant/equipment investment	2016	2009, 2012, 2014, 2017	2010, 2015	2011
Cost savings	2009, 2010, 2013	2011	2016, 2017	2012, 2015, 2014
New jobs	-	-	-	2017
Increased sales	-	-	2012	2013
Retained lost sales	-	-	2014	-
Info systems investment	-	-	-	-
Avoided investments	-	-	-	-
Other Investment	-	-	-	-

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 further about four detailed investment categories.

As reported in Table 9, the 2017 respondents said that there were 397 new or retained jobs as a result of the MMEC visit. New and retained sales were about $63 million. Cost savings totaled approximately $20.8 million and capital and workforce investments were roughly $23.2 million. Avoided unnecessary investment totaled about $793,800.

There are nine years of data collected in a consistent manner in Table 9, which could potentially reveal trends and/or cyclic patterns. Unfortunately, extreme year-to-year volatility in the reported outcomes mask trends and other patterns. For example, the number of new and retained jobs dropped from 880 in 2011 to 440 in 2012, then rebounded to 660 in 2013.

An examination of the responses revealed a number of cases where the value of the estimated outcomes were dominated by a few (mostly one, but at most two very large) responses. These few responses can skew time series analysis and obscure long-run trends. Typically, large responses accounted for one-third to one-half the reported total. 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 almost as volatile as the unedited. For example, the edited figures for new and retained jobs still bounce from 168 in 2014 to 280 in 2016, then to 297 in 2017. 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.

All of the outcome categories had one characteristic; sizable increases from recession lows and then stabilization within a range. For example, the value for new and retained sales was $8.9 million in the recession year 2009, but the edited values never dropped below $11 million in the following years and stood at $33.8 million in 2017.

The lower portion of Table 9 presents detailed data for subcategories of capital and workforce investments. 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.

The 2010-17 ranges for edited values of the quantitative outcomes in each category are as follows:

Category	Range
New and retained jobs	160-297
New and retained sales	$11-$37 million
Cost savings	$1.3-$6.6 million
Capital and workforce investments	$1.2-$19 million
Investment in plant/equipment	$800,000-$14.2 million
Investment in information systems or software	$190,000-$750,000
Investment in workforce practices or employee skills	$175,000 -$1.3million
Other investments	$2.9-$8.6 million
Avoided unnecessary investments	$150,000-$1.9 million

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

	2017		Total Five Years (2013-2017)	Since MMEC Inception (1996)
Economic Impact	As reported	Edited		
New and retained jobs	397	297	2,303	2,743
New and retained sales	$63,024,501	$33,824,501	$408,970,888	$1,218,505,804
Cost savings	$20,817,817	$6,558,817	$36,682,170	$107,993,892
Capital and workforce investments	$23,233,163	$17,233,163	$105,416,651	$229,938,100
Investment in plant/equipment	$12,960,300	$6,960,300	$25,917,000	$12,960,300
Investment in information systems or software	$695,120	$695,120	$2,591,120	$695,120
Investment in workforce practices or employee skills	$1,266,149	$1,266,149	$3,659,933	$1,266,149
Other investments	$8,311,594	$8,311,594	$73,248,598	$8,311,594
Avoided unnecessary investments	$793,800	$793,800	$5,272,758	$793,800

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 2017 respondents said that there were 125 new jobs created and 272 jobs retained for a total of 397 jobs.

The preliminary data suggest that average wages for Montana manufacturing jobs were about $48,340 in 2017. Total wages associated with the new and retained jobs were approximately $19,190,980 (397 X $48,340 = $19,190,980). Using an average tax rate of 4 percent, the new and retained workers paid approximately $767,639 ($19,190,980 X .04 = $767,639) 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 in new manufacturing wages.

Calculations based on employment and wage multipliers are reported in Table 10. The 397 new and retained jobs associated with MMEC visits reported in 2017 led to a total of 1,421 (397 X 3.58 =1,421.3) new jobs in Montana and approximately $52,199,466 ($19,190,980 X 2.72 = $52,199,466) in statewide wages. The additional wages generated roughly $2,087,978 ($52,199,466 X .04 = $2,087,978) in Montana individual income tax revenue.

Table 10. *Economic impacts of MMEC services, 2017.*

Sector	Jobs	Wages	Montana individual income taxes
Manufacturing	397	$19,190,980	$767,639
Other industries	1,024	$33,008,486	$1,320,339
Total	1,421	$52,199,466	$2,087,978

RETURN ON INVESTMENT AND FEES

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 2017, MMEC matched the federal funds with $325,000 from the State of Montana and $575,742 in project fees that were charged to Montana manufactures that 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 a 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 shown in Table 10, MMEC projects generated approximately $2,087,978 in Montana individual income taxes from both direct and indirect jobs. Based on $325,000 calendar year funding for MMEC, Montana's return on investment during 2017 was approximately 6.4 to 1 ($2,087,978 ÷ $325,000 = 6.42). Therefore, the public dollars invested in MMEC provide Montanans an excellent rate of return.

As presented in Table 9, MMEC clients reported $6,558,817 in costs savings, $793,800 in avoided unnecessary investments and $33,824,501 in new or retained sales. Assuming a modest 10 percent gross margin, the net gain to clients of the new or retained sales was $3,382,450 (0.1 X $33,824,501 = $3,382,450). Cost savings + avoided investments + gross margin associated with new and retained sales equals $10,735,067 ($6,558,817 + 793,800 + $3,382,450 = $10,735,067). Based on the $575,742 in fees paid by MMEC clients, their return on investment in 2017 was approximately 18.6 to 1 ($10,735,067 ÷ $575,742= 18.64). Therefore, the fees paid by MMEC clients provide them an excellent return.

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