

The latest MEMS industry commercialization report card

by [Roger H. Grace](#) |
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(jaker5000/E+/Getty Images) An important goal of the MEMS Report Card is to serve as a vehicle to help guide industry participants to best overcome the barriers to the successful commercialization of MEMS and achieve maximum success in a timely fashion.

The MEMS Industry Commercialization Report Card (Report Card), introduced in 1998, has the objective to track and report on the progress (and sometimes lack thereof) in the commercialization of the worldwide MEMS industry.

The impetus of the Report Card was based on my invitation to participate in a panel discussion at the seminal Hilton Head Conference a.k.a. Solid-State Sensors, Actuators and Microsystems Workshop which is held bi-annually at the lovely South Carolina resort town in early June.

The topic of the panel discussion was "Why aren't there more MEMS millionaires?" To come up with answers to that thorny question, and as a market research consultant, I decided to interview a number of the approximately 300 attendees.

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I presented my initial results to rave reviews and lots of questions. I decided to continue the market research process by creating a Report Card of nine critical success factors deemed vital to commercialization success by my research. Five additional topics were soon added, based on continuous reassessment of the ever-changing dynamics and resultant performance of the MEMS industry. It has remained at this level since 2003.

The Report Card is unique in the technology commercialization strategy sector and also to the MEMS industry. It has been widely published and presented worldwide since its introduction and is widely accepted internationally as a valuable and actionable tool for MEMS industry participants to create winning business strategies for their organizations.

Research methodology

Questionnaires were emailed to 90 selected individuals in the [Roger Grace Associates](#) database who have, and continue to play, major roles in the MEMS commercialization process. These "expert" participants represent a broad range of MEMS manufacturers, users of MEMS as well as individuals who represent companies engaged in MEMS infrastructure, e.g. foundries, design software, and equipment providers. Academics were not included in the research universe.

The participants span the globe, with the majority from the US and Europe. They were asked to rate the 14 critical success factors/topics with grades "A" through "D," using pluses and minuses where applicable. Additionally, they were asked to provide specific comments (a.k.a. "verbatim"), providing rationale for their assigned grades.

The 43 respondents (an exceptional response rate of approximately 50%) have a collective experience of over 1,000 years--an average of about 25 years per respondent. Follow-up interviews were also conducted to obtain specific information on the rationale for the submitted grades. Certainly, this was an exceptionally well-experienced and well qualified group of participants...a.k.a. "experts."

This research approach, known as "Delphi," provides the best possible insight into a research topic where a statistically significant/projectionable approach is not feasible. These statistically significant research projects are similar to those used during elections to help forecast outcomes.

The problem

MEMS technology established vis-à-vis the discovery of the piezoresistive effect at Bell Laboratories in 1955 by Charles Smith is approximately the same “age” as Integrated Circuit (IC) technology. The later was established vis-à-vis the semiconductor effect discovered at the same laboratory by Bardeen et al. only a few years earlier.

More importantly, however, the total sales of MEMS as reported by numerous groups in 1998 was approximately 1/25th the sales of ICs at the time of the publishing of the first Report Card. The MEMS market for 2019 has been reported by several organizations to be approximately \$13-15B (US), whereas the total semiconductor market for 2019 was reported to be in excess of \$419.18B (US), down from \$469.4B in 2018 and a decline of 12% from the previous year (ref: Gartner)--approximately a 30:1 ratio.

The positive news here is that the MEMS market has been reported to be growing over the past several years at a compounded annual growth rate (CAGR) of approximately 10% (primarily fueled by mobile phones/tablets, automotive vehicles and consumer products). However, the question still remains, "Why is there still such a disparity in the market sizes?" The Report Card's raison d'être is to help address this seemingly apparent paradox. The bottom line...if you can't measure it...you can't fix it!

Results

The figure below provides the letter grade results of the 14 topics of the MEMS Commercialization Report Card on a yearly basis from 1998 to 2019. It also provides the change in grade from 2018 to 2019. The 2019 Report Card assigned an overall grade of B- to the 14 critical success factors for MEMS commercialization. The overall grade has not changed since 2010. More importantly is the change in the grades for individual categories.

2019 MEMS COMMERCIALIZATION REPORT CARD																							
SUBJECT / YEAR	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	Δ
R&D	A	A	A	A	A	A-	A-	A-	A-	A-	B+	B	B	B+	B	B	B	B	B+	A-	A-	B+	-1
Marketing	C-	C	C+	C+	C+	C	C	C+	C+	C+	C+	C	C	C+	C+	B-	B-	B	B	B	B	B-	-1
Market Research	C	B-	B-	B-	B	B	B+	B-	B	B	B	B+	A-	B	B-	B-	B-	C+	C+	B-	B-	B-	0
Design For Manufacturing	C+	B-	B	B	B	B	B	C+	B-	B	B+	A-	A-	B+	B-	B	B+	A-	A-	A-	B+	B	-1
Established Infrastructure	C+	B	B+	A	A	A	A	A-	A-	A-	B+	B+	A-	0									
Management Expertise	C	C	C+	C+	C+	C+	C+	B-	B-	B	B	B	B	B	B	B	B	B	B	B	B	B	0
Venture Capital Attraction	C	B-	B+	A	C	C-	C	C+	C+	C	C-	D	D+	D+	D+	D+	D	D	D	D+	C-	C-	0
Creation Of Wealth	C	B-	B+	A	C	C-	C-	C-	C-	C	C	D+	C-	C+	C+	C+	B-	C+	C+	C+	C+	C+	0
Profitability	C-	C-	C-	C-	C-	C-	C-	C	C+	C	C	C-	D	C-	C	C+	C+	C	C-	C-	C	C	0
Industry Roadmap	INC	B-	B	B+	A-	A	A	B	B-	C+	C-	C-	C	C	C	C+	B-	C+	C	C-	C	C	0
Industry Association	INC	INC	INC	B	B+	B+	B+	B	B	B+	B	B	A-	B+	B+	B+	B+	B+	A-	B+	B-	B-	0
Standards	INC	INC	INC	INC	C	B-	B-	B-	C+	C	C	C	C+	C	C	C+	B-	C+	C-	C-	C-	C	1
Employment	INC	INC	INC	INC	INC	C	C	C+	C+	C+	C	C-	C	C+	C+	C+	B-	B-	B	B	B	B	0
Cluster Development	INC	INC	INC	INC	INC	B	B+	B+	B	B-	C+	C+	C+	C	C+	C+	B-	C+	B-	C+	C+	C+	0
Overall Grade	C+	B-	B	B	B-	B-	B	B	B-	B-	C+	C+	B-	B-	B-	B-	B	B-	B-	B-	B-	B-	0

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Of the 14 topics, Established Infrastructure received the highest grade of A-. It has sustained this grade for many years. Venture Capital Attraction received the lowest grade of C-. Standards (C) increased one grade level. Three topics fell one grade level: R & D (B+), Marketing (B-) and Design for Manufacturing and Test (B). Grades for the remaining nine topics remained constant.

The lowest C- grade established that Venture Capital Attraction continues to need major improvement and may be a critical factor restraining the industry from realizing its true potential. In 2018, Venture Capital Attraction has finally emerged from its D level since 2009 when the world-wide financial crises hit the U.S. economy. Since that time, venture capital monies have been substantially targeted to software and social media startups. Profitability at C and Creation of Wealth at C+ make up what I consider to be the triumvirate forming the financial sector of the Report Card.

Summary

The purpose of the Report Card has been to provide MEMS industry participants with an objective assessment of the 14 critical success factors over time and to act as a tool to help them better understand, respond to and exploit the ever-changing dynamics and evolution of the MEMS industry. The Report Card has been developed not only to help assess the progress of the commercialization of this technology but also (and more importantly) to serve as a vehicle to help guide industry participants to best overcome the barriers to the successful commercialization of MEMS and achieve maximum commercialization success in a timely fashion. The results of the 2019 Report Card should provide industry participants with valuable information to effectively help craft their business strategies moving forward.

For more details on the results of the 2019 Report Card, please go to [The latest MEMS commercial report card: Behind the grades.](#)

Want to learn more?

The 2019 MEMS Industry Commercialization Report Card was presented virtually at the MANCEF Commercialization of Emerging Technologies (COMS), October 19-22, 2020. The You Tube presentation is available on the [Roger Grace Associates website.](#)

Additionally, detailed analysis of several of the key topics, including respondents' "verbatim" will be provided in a follow-up article on the 2019 MEMS Industry Report Card.

Want to participate in the 2020 Report Card Survey?

Those wishing to participate in the creation of the 2020 MEMS Commercialization Report Card are encouraged to contact me at rgrace@rgrace.com to receive supporting documentation and directions.

Roger H. Grace is president of [Roger Grace Associates](#), a Naples Florida-based marketing consultancy, which he founded in 1982 and which provides market research, strategic marketing communications and business development services to the MEMS, sensors and capital equipment industry.