Because Dreams Need Doing:
New Messages for Enhancing Public Understanding of Engineering

Final Report—February 2007

Mitch Baranowski, BBMG
James Delorey, Global Strategy Group

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Executive Summary

The market research effort described in this report began in August 2006 and concluded in January 2007. The goal was to develop and test the effectiveness of a small number of messages for enhancing public understanding of engineers and engineering. The research was part of a project funded by the National Science Foundation and carried out by a committee of the National Academy of Engineering (NAE).

Prior to starting our work, we did a research review, an audit of communications efforts throughout the engineering community, and carefully studied the National Academy of Engineering's comprehensive message inventory from 2002[1].

To test our preliminary messages, we launched a robust research program comprising 12 in-depth interviews, four focus groups with teens, one focus group with parents of young people ages 9-19, four sets of discussion groups with children ages 9-11, and a nationwide online survey with adults that included oversamples of informed adults[2] and teens ages 14-17.

We verified that certain messages have been successfully conveyed. For example, the idea the engineers need to be good at math and science has been very effectively communicated. Engineering is also seen as hard work. It solves problems. It designs, builds and constructs things. Yet it is also viewed as creative and having a positive effect on peoples' everyday lives. And while it is not viewed as nerdy or boring by the general public (an image engineers are often quick to ascribe to themselves), no one can seemingly name a spokesperson or personality associated with the field.

To improve the image of engineering, we recommend reframing the way we talk about and portray the field and its practitioners. We propose a new lexicon: away from skill in math and science and solving problems to making a world of difference.

Proposed New Positioning Statement for Engineering

No profession unleashes the spirit of innovation like engineering. From research to real-world applications, engineers constantly discover how to improve our lives by creating bold new solutions that connect science to life in unexpected, forward-thinking ways. Few professions turn so many ideas into so many realities. Few have

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[1] National Academy of Engineering. 2002. Raising Public Awareness of Engineering. L. Davis and R. Gibbin, Eds. Washington, D.C.: National Academies Press

[2] "Informed adults" refers to individuals who follow the news on an ongoing basis, including local, state, or national political developments; may be involved in their communities as volunteers; and have some education beyond high school.

> *such a direct and positive effect on people's everyday lives. We are*
> *counting on engineers and their imaginations to help us meet the*
> *needs of the 21st century.*

Our new positioning promotes engineering as a dynamic experience, one of
discovery, design, imagination, innovation and meaningful contribution.

Four of the five messages we developed tested extremely well with young
children, teens, and adults in terms of overall appeal, believability and credibility:

> *Engineers make a world of difference.*
> *Engineers are creative problem-solvers.*
> *Engineers help shape the future.*
> *Engineering is essential to our health, happiness and safety.*

And in testing potential campaign slogans, two strategic favorites emerged:

> *Because dreams need doing*
> *Turning ideas into reality.*

In the end, messages must be taken to the marketplace to be effective, and so
this report concludes by making a case for organizing a sustained engineering-
community-wide communications campaign that uses a variety of tactics to reach
key audiences, from parents and guidance counselors to engineering societies
and leading firms.

Introduction: Goals and Objectives of the Project

Just as they did in the twentieth century, engineers and engineering will continue making extraordinary contributions to the nation's global competitiveness, security, and standard of living in the years ahead. But as we know from previous polls and research studies, these contributions risk going unsung and underappreciated, and a future generation of engineers is hardly assured given young people's declining interest in the field.

The engineering community currently spends more than $400 million annually to promote greater public understanding of engineering, according to the 2002 National Academy of Engineering (NAE) report, *Raising Public Awareness of Engineering*. Engineering is brought to life through innovative design-and-build contests, such as National Engineer's Week Future City competition (www.futurecity.org) and the FIRST LEGO League (www.usfirst.org); it is illustrated in compelling exhibits at numerous science centers and museums; it is promoted through hundreds of grassroots programs targeting students, teachers, guidance counselors and parents.

Despite these laudable efforts, however, surveys show the public has a generally poor understanding of the role engineering plays in improving quality of life and a negative view of engineers' engagement with societal and community concerns, at least in comparison to scientists (Table 1).

TABLE 1 Characteristics Associated with Engineers and Scientists

	Engineers	Scientists	Neither	Don't Know	Decline to Answer
	%	%	%	%	%
Saves Lives					
2003	**14**	**82**	**1**	**2**	**-**
1998	**6**	**65**	**-**	**3**	**21**
Sensitive to societal concerns					
2003	**28**	**61**	**5**	**5**	*****
1998	**47**	**57**	**-**	**8**	**3**
Cares about the community					
2003	**37**	**51**	5	**6**	1
1998	**24**	**46**	**-**	**9**	**12**

SOURCE: Adapted from Harris Interactive. 2004. American Perspectives on Engineers and Engineering. Poll conducted for the American Association of Engineering

Societies. Final report. February 13, 2004. Available online at
http://www.aaes.org/harris_2004_files/frame.htm.

And, while the public may not view engineers as "nerdy," it does perceive
engineering to have less prestige than many other professions
(Table 2).

TABLE 2 Ranking of Professions According to "Very Great Prestige" in 2006, by
Percent

Firefighter	63	Architect	27
Doctor	58	Athlete	23
Nurse	55	Lawyer	21
Scientist	54	Entertainer	18
Teacher	52	Accountant	17
Military Officer	51	Banker	17
Police Officer	43	Journalist	16
Priest	40	Union Leader	12
Farmer	36	Actor	10
Engineer	34	Stock Broker	11
Memb. Of Congress	28	Real Estate Agent	6

SOURCE: Harris Interactive 2006. Firefighters, Doctors and Nurses Top List as
"Most Prestigious Occupations," According to Latest Harris Poll. *The Harris Poll*[®]
#58, July 26, 2006. Available online at
http://www.harrisinteractive.com/harris_poll/index.asp?PID=685

Clear and concise messaging will help correct misconceptions about engineering
as well as improve the image of the field. Effective messages will arm the
engineering community with a compelling and consistent way to promote itself to
a diverse set of key audiences. NAE recognizes that effective messages are a
critical (but not sufficient) element for cultivating greater public awareness. The
challenge must be viewed in the context of launching a sustained engineering-
community-wide campaign; making improvements to the undergraduate
engineering education system; and investing sufficiently in basic engineering
research.

The stated goal of this project, funded by the National Science Foundation (NSF)
and carried out by the National Academy of Engineering (NAE), is to encourage
coordinated, consistent, and effective communication by the engineering
community about the role, importance, and career potential of engineering to a
variety of audiences, including school children, their parents, teachers, and
counselors.

Specifically, the goal has three objectives:

- Identify a small number of messages that appear likely to encourage greater public understanding of engineering;
- Test the effectiveness of these messages in a variety of audiences; and
- Disseminate the results of the message testing to the engineering community.

Our Approach: Brand-Driven Communications

A brand is much more than a logo or slogan. It is what you stand for in the mind of your audiences. It is the promise of your mission. A world of associations. Think "motorcycle" and then "Harley Davidson," and you will experience the power of branding at work. The latter conjures images of the open road, the limitless horizon and leather-clad road warriors; it evokes values such as freedom and independence in ways that the mere mention of a motorbike cannot.

Typically, a brand consists of three parts: a message, image and experience. Branding is the art of creating and delivering a consistent message, image and experience that brings your unique difference to life in the minds and hearts of your stakeholders. In the case of engineering, it is creating the perception that there is no other profession like engineering when it comes to turning ideas into reality or making a world of difference.

Once thought to be the sole province of for-profit companies selling retail products, the principles behind branding (namely differentiation and relevance) have helped numerous organizations clarify the one idea that sets them apart to connect emotionally with their audiences. With the proper support and implementation, branding helps organizations stand out, cultivate relationships, win loyalty and inspire action.

At Bemporad Baranowski Marketing Group (BBMG), we believe in the power of brand-driven communications. In practice, this means ensuring that all communications strategies and tactics are seamlessly integrated to reinforce the *same* brand message, image and experience. From toolkits for science teachers to nationwide competitions like Future City, talking points for professional engineers to niche web sites like Engineer Girl, our approach is designed to help identify the core themes and supporting messages that can be deployed to evoke a world of positive associations about engineering.

Smart from the Start: Strategic Planning Session

To ensure that our messaging efforts were closely aligned with the project objectives, we began our work with a joint planning session with committee members (Appendix A) on July 13, 2006.

At this meeting, we reviewed our communications objectives, set clear priorities, and established an action plan for developing new messages and then testing them through a strategic combination of in-depth interviews, focus groups, triads with younger children, and a nationwide online survey.

At the meeting, we gained additional insights into the need for effective messages that will:

- o Avoid mistakes of previously ineffective campaigns;
- o Promote engineering in and of itself, not blurring it with science or technology (though they are intertwined);
- o Promote positive associations that will help counter negative perceptions;
- o Underscore the enormous contribution that engineers make to society;
- o Cultivate awareness of what engineers actually do;
- o Tap the field's reservoir of creativity, invention and discovery;
- o Position the benefits of a career in engineering; and
- o Engender excitement about the field so it "primes the pipeline" with future engineers, especially younger women and minorities.

This last point was emphasized. Engineering's image (or lack thereof) is hampering recruitment efforts. Messages, it was voiced by the committee, must skew younger, intersecting students before they opt out of math and science tracks.

We also recognized the need to build a strong rationale for effective messages based on our research findings. Such a rationale was identified as a critical success factor for moving ahead to secure the coordinated adoption and use of effective messages by the many diverse entities involved in engineering.

Communications Audit

Since developing a clear vision for new messages hinges on an informed sense of past and current efforts, we evaluated previous research as well as a broad range of communications materials (printed, visual, electronic, etc.) about engineering to identify what messages appear to be most effective in generating public awareness.

In addition to such benchmark studies as the Harris Polls on *American Perspectives on Engineers and Engineering*[3] and *Extraordinary Women Engineers* project report[4], of critical importance was the NAE's own 2002 Raising Public Awareness of Engineering report. This exhaustive study surveyed the communications, education and outreach activities of 177 engineering organizations.

We also paid particular attention to *National Engineers Week* (www.eweek.org) given its profile, track record and reach.

To guide our communications audit, we used the following framework based on our approach to brand-driven communications:

> *Brand Message:* How do key stakeholders describe engineers or engineering? To what extent do messages…
>
> - Clearly articulate a brand promise
> - Clearly differentiate the field
> - Inspire loyalty, confidence and action
> - Make it easy to understand what engineering is and why it matters
> - Demonstrate consistency
>
> *Brand Image:* How do marketing communications materials present engineers or engineering? To what extent do images…
>
> - Reinforce and extend the brand promise
> - Differentiate the field in the marketplace
> - Provide a clear visual "read" of engineers and engineering
> - Use memorable and compelling icons, colors and typography
> - Create a unique visual language
> - Demonstrate consistency
>
> *Brand Experience*: How are the core messages and images brought to life or made concrete? From competitions and interactive websites to media interviews, how do students, parents, teachers and others actually experience engineers and engineering?

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[3] Available online at http://www.aaes.org/harris_2004_files/frame.htm.

[4] Available online at http://www.engineeringwomen.org/pdf/EWEPFinal.pdf.

Situation Analysis: Preliminary Insights

Key Audiences

To date, communications efforts have been aimed mainly at the following audiences:

- o Elementary students K-5
- o Middle school 6-8 and high school students 9-12
- o College and graduate students
- o Parents, teachers and guidance counselors
- o Policymakers and opinion leaders
- o Engineering community
  - NAE
  - Associations and societies
  - Engineer-driven corporations
  - Engineering firms
  - Engineering schools/programs
  - Museums and science centers
  - NSF and other relevant donors/funders
- o News media
  - Business editors
  - Education editors
  - Science/technology editors

Marketing Communications Outreach

As noted above, there is considerable time, energy and money being spent to promote engineering. Despite an abundance of creative outreach programs, the field's communications activities, on the whole, are largely ad hoc, uncoordinated and hard to measure in terms of meeting stated goals about correcting misperceptions and aiding recruitment efforts.

- **Ad Hoc Efforts.** More than $400 million is spent annually on cultivating greater public awareness of engineering.[5]

  - o The outreach is mostly ad hoc: few organizations or communicators use written strategic communications plans.

  - o It is hard to measure outcomes: few organizations use specific metrics where progress can be tracked, though most believe their programs to be successful.

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[5] Extrapolation of overall expenditures in 2002 NAE Inventory was noted to be $403.5 million.

- **Uncoordinated.** There is relatively little coordination among the engineering community when it comes to outreach.

    o While not universal, the desire to coordinate is strong, especially in terms of reinforcing engineering's contribution and its career benefits.

    o Prevailing attitudes, a lack of resources and inadequate infrastructure are a few of the barriers to robust coordination.

- **Skewing Older.** Most outreach targets older K-12 students (i.e., high schoolers) in an effort to "prime the pipeline."

    o New research shows that education and grassroots activities should skew younger (K-3) to intersect children before they "de-select" math and science tracks.

- **Local for the Most Part.** Most outreach programs are local with a few exceptions, most notably National Engineers Week.

    o National Engineers Week is widely considered to be among the most effective outreach efforts (though its brand is not consistently recalled among associations, societies or industry executives).

    o Many also called out "New Faces of Engineering" for introducing audiences to diverse young people in the field.

- **Diverse Communications Tactics.** Most outreach programs use a variety of tactics, including design-and-build competitions, mentor programs, toolkits for teachers and guidance counselors, school-to-work training, etc.

    o Such variety makes it more difficult to deliver a consistent message.

    o Even the multiple tools of one organization are often wildly inconsistent.

The Messaging Landscape

The 2002 NAE inventory noted dozens of messages being used by organizations to promote engineering. These messages, it said, expressed four major themes:

- The value and nature of engineering and engineers;
- The academic skills (e.g., math and science) needed to pursue engineering as a career;

- Employment opportunities in engineering; and
- The connection between engineering and quality of life.

In general, messages targeting younger children attempt to position math/science as easy or fun, and engineering as challenging, exciting, hands-on and rewarding. Encouragement ("You can do it") is a common undercurrent.

Messages for older, prospective college students tend to reinforce what a great career it is: Engineering will prepare you for success, and allow you to use your knowledge in creative ways that will improve people's lives.

Specifically, most messages have been very direct, rational statements emphasizing the benefits of engineering. For example, a few of the typical messages for students include:

- An engineering education is valuable as the basis for a career.
- Engineering offers challenges, excitement, opportunity and satisfaction.
- Engineering is worthwhile, challenging, fun and within reach.
- Engineering careers provide flexibility that allow for family life choices.
- It's not as complicated as you think. Anyone can understand the principles of engineering.
- Engineering includes a variety of fields of study and occupations.
- Engineers are not what people expect.

In April 2005, the NAE convened a small group of advertising and PR professionals with decades of experience in engineering- or technology-related campaigns to discuss the field's messages.

They recommended avoiding messages asserting that…

- Math/science is fun or easy. The creative professionals said an education in math or science should not be trivialized and that engineering requires someone with certain aptitudes.

- Engineers improve the quality of life. This was thought not to be unique to engineers and also not readily believable.

- Engineers design/build. Although this was recognized as what engineers do, the participants felt that it did not do justice to the importance of engineering.

At the end of their discussion, the creative professionals identified the following categories for possible message development:

- Engineers are necessary – the "essentiality" of engineers.
- Engineers have the answers or are the people to go to for the answers.

- Engineers/engineering make things happen or make things better.
- Engineers connect things – not just physical things, they connect the creative with the practical.

Preliminary Message Development

Target Audiences

For the purposes of this project's preliminary message development and testing, we prioritized our target audiences as follows:

- Middle school students: Grades 6-8
- High school students: Grades 9-12
- College and graduate students
- Parents, teachers and guidance counselors
- Engineering professionals and related firms and associations

Overarching Themes and Key Messages

Based on the preliminary insights from our communications audit, we developed the following overarching themes to guide early message development.

A LIMITLESS IMAGINATION
This theme speaks to the innovative, design-driven nature of engineering.

AN ENTERPRISING SPIRIT
This theme recognizes the inventive spirit and pioneering contributions of the field.

FREE TO EXPLORE
This theme evokes the constant journey that is the engineer's quest for new solutions.

IDEAS IN ACTION
This theme underscores how engineering uniquely bridges the world of science with the real world.

SHAPE THE FUTURE
This theme speaks to how engineering offers an empowering and rewarding career.

LIFE TAKES ENGINEERING
This theme focuses on the field's essential role and life-changing work.

After committee input, review and approval, we developed a robust research program to test these preliminary messages using qualitative and quantitative methods.

Research Methodology

Our research program consisted of two phases, a qualitative phase comprising interviews, focus groups, and triads, and a quantitative nationwide survey. The qualitative phase consisted of:

- **In-depth Interviews.** Facilitated in-depth interviews with a cross-section of 12 educators, opinion leaders, and engineers.

- **Focus Groups.** Four focus groups with young people ages 12-15 and 16-19 in Raleigh, NC, and Phoenix, AZ, and one group with parents of young people ages 9-19 in Raleigh.

- **Youth Triads.** Four sets, with three children ages 9-11 in each group, 45 minutes to 1 hour each.

The quantitative phase consisted of a roughly 10-minute online survey of 1,234 Americans (666 adults, including an over-sample of 200 informed adults,[6] and 568 young Americans, ages 14-17).

Research Findings

In-depth Interviews

In September and October 2006, BBMG and Global Strategy Group conducted 12 in-depth interviews (IDIs) with a cross-section of educators, opinion leaders, and engineers. The goals of the IDIs were to reveal insights from engineering-community representatives on messages they believe would encourage greater public understanding of engineering; identify the best approaches for speaking to young people about careers in engineering and find the messages that would resonate with educators and others in the field.

Key findings of the In-depth Interviews included:

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[6]Informed adults" refers to individuals who follow the news on an ongoing basis, including local, state, or national political developments; may be involved in their communities as volunteers; and have some education beyond high school.

- There is a wide gap between how engineers would like themselves and their field to be perceived and how engineers and the field of engineering are actually perceived.

- In the best light, engineers are seen – and see themselves – as "curious," "hard workers," who figure out the solutions to tough problems, and leave their mark on the world.

- Engineers can also be very hard on themselves, and can sometimes see themselves and others in their field as "Dilberts" – "book-smart," "nerdy," "know-it-alls;" "isolated," "myopic," and "not-cool."

- There is no readily identifiable "public face" of engineering.

- Cable programs that explain "the way things work" or that feature engineering "marvels" can expose far more people to a positive image of the field than the best-organized "engineering fair" or popsicle-stick bridge-building contest, which attract people who are already interested in engineering.

- Engineers are wary that their work is taken for granted, and want to call attention to the contribution engineering makes in our everyday lives. Through an observant eye, engineering is all around us, and it takes a "powerful awareness" to be able to see it.

- Educators and engineers who have done outreach to young people strongly recommend treating young people with respect, and giving them some real challenges to think about.

"Listen to what they're buying into,
and put it in their language."
– Vocational Instructor/Middle School Technology Teacher, Florida

- Our preliminary themes were, generally, well-received by IDI participants, who especially liked "Ideas in Action," "Life Takes Engineering," and "A Limitless Imagination."

- Engineers and educators alike embrace an image of engineering as creative and imaginative problem-solving; and of overcoming the "seeming impossibility of it all."

Focus Groups and Youth Triads

In October 2006, we conducted four focus groups with young people ages 12-15 and 16-19 in Raleigh, North Carolina, and Phoenix, Arizona, and one group with parents of young people ages 9-19 in Raleigh.

The focus groups and youth triads examined:

- Student views of current school subjects and hopes for future careers.
- Their understanding of what engineering is and impressions of who engineers are.
- Parents' attitudes toward their children's careers and toward their becoming engineers.
- Reactions to examples of engineering and messages about engineering. (We tested engineering-related images among young people ages 9-11 in youth triads.)

Our findings included the following:

- Engineering is poorly understood by most students, even among those who are most informed about the field.

  "Engineering is you fix things like cars and stuff."
  – Teen, 16-19, Raleigh

  "Someone who fixes things… Buildings and fixing cars
  and trains… Kind of like architecture." – Teen, 16-19, Phoenix

  "Being able to fix things, things that are part of the engine."
  – Teen, 12-15, Phoenix

- If some students think engineers are much more smart, creative and imaginative than just 'being good at math and science,' many young people also think that engineers only sit at their desks or computers and have little interpersonal contact in their work.

  "Seems like a lot of engineers sit behind a desk and don't do much fieldwork…
  It's a desk job. I'd beat my head against
  the wall if I had to do that." – Teen, 16-19, Raleigh

  "They have a stereotype of being geeky… shut up in their workshop and doing
  the same thing over and over again."
  – Teen, 12-15, Phoenix

- When students learn more about engineering, they react considerably more positively toward the field, and many find that they can relate

personal interests to engineering in a way they had not considered or known about before.

"If you told somebody that they could invent the next Xbox, you'd get a lot of kids who'd want to be an engineer." – Teen, 16-19, Phoenix

"It sounds kind of cool, it's like the whole world is there…
You get to build something that no one has ever seen before…
It's fun to build things and help people, I'd be able to design things
and take stuff apart and know how it works."
–Boy, 10-11, Phoenix

- Children repeatedly express a desire for well-paying jobs that are engaging and conducive to making a positive difference in the world.

- Girls, particularly, tend to associate 'helping people' and 'making a difference' with fields like medicine or teaching – not engineering.

- Students are curious about the challenges for problem-solving in society, like inventing technologies that relieve human hunger, preserving rainforest habitats, or creating the DNA diagnostics and pharmaceutical products that save lives.

"Engineering is behind the scenes, helping people. They design the machines
that help people. I think most of engineers' work is taken for granted
because you don't see what they've done."
–Teen, 16-19, Raleigh

"You don't directly help people like a doctor, you invent something
that will help them later." –Teen, 12-15, Raleigh

Triads: Results of the Image Testing

In the triads, young boys and girls were presented with various images related to engineering, in the form of printed cards which they could choose and trade with one another.

- The children in our sessions did not select a single, consistent set of examples or images of engineering; they picked examples or images that connect with them depending on their individual personalities. Hence, a broad set of images can appeal to a very wide range of children, as long as images draw on concepts to which students can relate their interest.

- Younger girls tended to pick images involving female engineers, while boys did not. Boys were more likely than girls to pick images that feature "things," though girls selected things like iPods, too.

"I like roller coasters. And the bridge. And I like
cell phones and Gameboys. You make it, and people use it
in everyday life and stuff."– 10-11 year-old girl, Phoenix

- Children expressed dislike for pictures of individuals that appear to be standing or sitting at a desk, reflecting their concern that engineering can be "boring or repetitive, not with other people" as a career path.

Online Survey Findings[7]

In December 2006, we conducted a 10+ minute online survey with 1,234 Americans, including 666 adults (including an over-sample of 200 informed adults) and 568 young Americans, ages 14-17.

- The margin of error at the 95% confidence interval among the adult interviews is +/-3.8%, and among teens the margin of error is +/-4.1%. The margin of error among other subgroups is larger.

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[7] "Topline" (summary) data from the survey are included in Appendix B.

We had two primary goals in conducting the survey:

- Place the findings and recommendations of the qualitative research on a solid empirical foundation.

- Provide statistically valid information about the relative value of each proposed message for the purpose of promoting a positive image of engineering.

Perceptions of Engineering

- When Americans think of engineers and engineering, among the first words that come to mind are "build," "design," "machines," and "create" (Tables 3a, 3b)

- Adults and teens alike believe engineers <u>have</u> to be good at math and science.

- Although in our in-depth interviews, engineers said they believed the public viewed them as "boring" and "nerdy," very few adults or teens in the survey described engineers this way.

- Across different age groups, Americans perceive engineers as:

    – Designing, drawing and planning things
    – Building, constructing and making things
    – And as "problem solvers"

- Teen girls are significantly less likely than boys to believe that engineers are creative, that the work is rewarding, or that engineers "have a positive effect on people's everyday lives."

TABLE 3a Phrases and Words that Describe Engineering or Engineers "Very Well," Adults, Informed, and Teens, by Percent Responding

	Adults	Informed	Teens
Must be good at math and science	86%	86%	84%
Designs, draws and plans things	61	59	63
Problem solvers	59	71	62
Builds, constructs and makes things	53	57	59
Creative	45	49	47
Well-paid	44	42	46
Get results	44	37	42

Must be smart to get into this field	43	47	56
Original thinkers	43	40	45
Hard working	42	41	62
Well-respected	39	34	34
The work is rewarding	36	37	32
Mostly men	35	38	37
Have a positive effect on peoples' everyday lives	32	38	36
Inventors	28	33	41
Leaders	23	19	22
Often work outdoors	17	13	20
Entrepreneurial	12	11	18
Mostly white	12	15	11
Requires too many years of school to get a degree	10	8	15
Starts new companies	7	7	14
Fun	7	9	9
Nerdy	5	6	14
Boring	4	4	12
Sits at a desk all day	2	4	6

SOURCE: Unpublished data from BBMG message development.

TABLE 3b Phrases and Words that Describe Engineering or Engineers "Very Well," Teens, Boys, and Girls, by Percent Responding

	Teens	Boys	Girls
Must be good at math and science	84%	85%	84%
Designs, draws and plans things	63	64	62
Problem solvers	62	68	57
Builds, constructs and makes things	59	59	59
Creative	47	55	41
Well-paid	46	48	44
Get results	42	44	40
Must be smart to get into this field	56	58	54
Original thinkers	45	44	45
Hard working	62	56	66

Well-respected	34	35	32
The work is rewarding	32	39	26
Mostly men	37	37	38
Have a positive effect on peoples' everyday lives	36	43	29
Inventors	41	44	39
Leaders	22	24	21
Often work outdoors	20	22	19
Entrepreneurial	18	18	18
Mostly white	11	10	12
Requires too many years of school to get a degree	15	15	15
Starts new companies	14	16	12
Fun	9	6	11
Nerdy	14	13	15
Boring	12	7	16
Sits at a desk all day	6	5	7

Examples of Engineering

- Among the most appealing examples of engineering are:

    - Machines that allow blind people to see
    - Building cars that run on alternative fuels
    - Protecting the water supply

- "Informed" adults are particularly interested in:

    - Wind power
    - Protecting the rainforest by developing new ways to farm that don't require so much land
    - Creating more advanced M.R.I. machines to do better brain and body scans to diagnose health problems
    - Solar energy

- Both boys and girls are very interested in machines that allow blind people to see and building cars that run on alternative fuels. There are some real gender differences in the examples of engineering that appeal to teens. Boys are most interested in space exploration and designing video games,

while the example that most interests girls is using DNA evidence to solve crimes.

Message Testing

After refining and narrowing messages during the qualitative phase of our research, we tested five messages in the online survey (Tables 4a, 4b). Four of the five messages tested well among all groups – adults, informed adults, and teens -- in terms of appeal, believability, and how much respondents "care" about the message and the examples included in it. These four also rated as the top four messages among minority respondents.[8]

TABLE 4a Refined Messages Seen as "Very Appealing," Adults, Informed, Teens, by Percent Responding

	Adults	Informed	Teens
Engineers make a world of difference. [9] From new farming equipment and safer drinking water to electric cars and faster microchips, engineers use their knowledge to improve people's lives in meaningful ways.	55%	56%	43%
Engineers are creative problem-solvers. They have a vision for how something should work, and are dedicated to making it better, faster or more efficient.	52	53	42
Engineers help shape the future. They use the latest science, tools and technology to bring ideas to life.	48	53	37
Engineering is essential to our health, happiness and safety. From the grandest skyscrapers to microscopic medical devices, it is impossible to imagine life without engineering.	48	49	35
Engineers connect science to the real world. They collaborate with scientists and other specialists (such as animators, architects or chemists) to turn bold new ideas into reality.	42	46	35

SOURCE: Unpublished data from BBMG message development.

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[8] The 1,234 total interviews in the online study include interviews with just 77 non-white adults and 116 non-white young Americans, ages 14-17. The margin of error among such small samples is quite large: +/-11.2% among non-white adults and +/-9.1% among non-white teens. While such small sample sizes make it impossible to differentiate between messages with much certainty among these two groups, it appears that these four messages are more appealing than "Engineers connect science to the real world." That fifth message also appears to be the most unpopular of the tested messages among non-white adults and teens.

We were aware of this limitation going into the study, but did not have sufficient funding for a more fine-grained study of different racial or other demographic groups. We encourage the National Academy of Engineering to undertake a more comprehensive study to identify messages that can be used to enhance public understanding of engineers and engineering among minority adults and youth.

[9] This message was inspired by a similar theme used to promote E-Week.

TABLE 4b Refined Messages Seen as "Very Appealing," Teens, Boys, and Girls, by Percent Responding

	Teens	Boys	Girls
Engineers make a world of difference. From new farming equipment and safer drinking water to electric cars and faster microchips, engineers use their knowledge to improve people's lives in meaningful ways.	43%	50%	38%
Engineers are creative problem-solvers. They have a vision for how something should work, and are dedicated to making it better, faster or more efficient.	42	53	33
Engineers help shape the future. They use the latest science, tools and technology to bring ideas to life.	37	46	30
Engineering is essential to our health, happiness and safety. From the grandest skyscrapers to microscopic medical devices, it is impossible to imagine life without engineering.	35	38	33
Engineers connect science to the real world. They collaborate with scientists and other specialists (such as animators, architects or chemists) to turn bold new ideas into reality.	35	44	27

SOURCE: Unpublished data from BBMG message development.

All five tested messages scored at least somewhat appealing among an overwhelming majority of adults, informed adults and teens.

In terms of how much respondents "cared" about what the statements say and the examples included in it, two messages – "Engineering is essential to our health, happiness and safety" and "Engineers make a world of difference" rated particularly high. (See data in Appendix B.)

The fifth message – about "connecting science to the real world" – was less appealing overall, and among teen girls especially. The "connecting science to the real world" message also rated lowest in terms of how much adults and teens "cared" about it and the examples in it.[10]

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[10] Quantitative instruments such as our online poll, given their limited feedback mechanisms, make it challenging to understand exactly why certain messages and slogans appeal, and why others do not. We recognize later in our recommendations an apparent contradiction between our least appealing message and our best testing tagline. See pp. 22-23.

The relative lack of resonance with this fifth message was confirmed when survey participants were asked to choose a single "most appealing" message (Table 5).

TABLE 5 Refined Messages Seen as "Most Appealing," Adults, Informed, and Teens, by Percent Responding

	Adults	Informed	Teens
Engineers make a world of difference. From new farming equipment and safer drinking water to electric cars and faster microchips, engineers use their knowledge to improve people's lives in meaningful ways.	31%	31%	28%
Engineers are creative problem-solvers. They have a vision for how something should work, and are dedicated to making it better, faster or more efficient.	22	21	23
Engineers help shape the future. They use the latest science, tools and technology to bring ideas to life.	19	19	16
Engineering is essential to our health, happiness and safety. From the grandest skyscrapers to microscopic medical devices, it is impossible to imagine life without engineering.	16	16	19
Engineers connect science to the real world. They collaborate with scientists and other specialists (such as animators, architects or chemists) to turn bold new ideas into reality.	12	13	14

SOURCE: Unpublished data from BBMG message development.

Tagline Testing

In addition to the above messages, the online survey also tested several possible taglines or slogans that might be used to promote engineering:

- Turning ideas into reality.
- Because dreams need doing.
- Designed to work wonders.
- Life takes engineering.
- The power to do.
- Bolder by design.
- Behind the next big thing.

The first two ideas listed above ("Turning ideas into reality" and "Because dreams need doing") were clear winners (Tables 6a, 6b).

"Turning ideas into reality" scored equally well with adults and teens.

"Because dreams need doing" seemed less appealing to adults, but was very appealing to teens – and was the only tagline that tested as appealing among teen girls as among teen boys. The tagline also tested very well among adult women, especially younger women.

TABLE 6a Taglines Testing as "Very Appealing," Adults, Informed, and Teens, by Percent Responding

	Adults	Informed	Teens
Turning ideas into reality. *	49%	46%	48%
Because dreams need doing.	26	24	42
Designed to work wonders.	23	20	25
Life takes engineering.	21	20	19
The power to do.	21	20	31
Bolder by design.	17	18	26
Behind the next big thing.	15	14	23

* Used by E-Week.

SOURCE: Unpublished data from BBMG message development.

TABLE 6b Taglines Testing as "Very Appealing," Teens, Boys and Girls, Teens by Age, by Percent Responding

	Teens	Boys	Girls	14-15	16-17
Turning ideas into reality.*	48%	54%	43%	55%	42%
Because dreams need doing.	42	43	42	47	39
Designed to work wonders.	25	29	21	30	20
Life takes engineering.	19	24	15	22	17
The power to do.	31	37	25	36	26
Bolder by design.	26	33	20	28	25
Behind the next big thing.	23	26	21	27	20

* Used by E-Week

SOURCE: Unpublished data from BBMG message development.

BBMG Strategic Recommendations

We believe this assignment represents much more than a messaging and research project. We believe it can be a critical first step toward reframing how the country views engineers and engineering. We see extraordinary potential to reimagine the field's identity to do greater justice to its outlook, passion, and many contributions. And to coordinate the delivery of a consistent message, image and experience.

"Frames" are useful devices for organizing messages. According to cognitive scientist and communications consultant George Lakoff [footnote ref], frames are part of our "cognitive unconscious"—we cannot consciously access them but we know them by their consequences: the way we reason and what counts as common sense. We also know frames through language. Words are defined through conceptual frames. When we hear a word, its frame (or collection of frames) is activated in our brains.

Examples of common frames include:

   o "Smart growth"
   o "Tax relief"
   o   "Developing nations"

In our view, it is time to stop talking about engineering in terms of benefits and required skills. We must start talking in terms of ideas and impact. In short, we must reframe engineering: from a world of *challenging math and science* to a

world of difference. <u>We should position the experience as one of discovery, design, imagination, innovation and contribution</u>. After all, engineers have awesome jobs…they get to imagine the future and make it happen! This notion is just one of many tremendously underleveraged assets.

A New Positioning Statement

Behind every powerful brand is a powerful positioning statement that serves as a compass, pointing the way to developing robust communications programs that consistently meet the desired goals.

To help reframe engineering from <u>benefits and skills</u> to a <u>world of difference</u>, we recommend that the engineering community strongly consider adopting the following positioning statement to anchor its communications efforts and encourage broader consistency:

> ***No profession unleashes the spirit of innovation like engineering. From research to real-world applications, engineers constantly discover how to improve our lives by creating bold new solutions that connect science to life in unexpected, forward-thinking ways. Few professions turn so many ideas into so many realities. Few have such a direct and positive effect on people's everyday lives. We are counting on engineers and their imaginations to help us meet the needs of the 21st century.***

The above positioning statement began to take shape during early message development and now aligns directly with the themes that were ultimately tested: improving people's lives, creatively solving problems, advancing bold new ideas that are essential to ensuring our health, happiness and safety in an increasingly resource-constrained world.

In the end, a strong positioning statement is a necessity for several reasons. It serves as a point of reference for any further communications (for example, advertising or PR campaigns). It encourages consistency by guiding the engineering community's public awareness efforts. It brings clarity to what truly sets engineering apart . It makes a case for why it matters.

Being inconsistent with the positioning strategy could undermine the engineering community's ability to raise awareness, shift attitudes and build brand equity. Not having such a statement will make achieving these goals virtually impossible.

New Messages

Key messages are those high-level statements that form the underpinning of any effective communications program. They are strategic in nature, designed to help advance an organization's or an industry's goals. Key messages form talking

points and are often shared with other groups via strategic memos or communications toolkits and the like. They usually come with guidelines about what messages will work better for what audiences.

Based on the strong results of our online survey, we are confident in recommending that the following messages be widely adopted for use by the engineering community.

> **Engineers make a world of difference.**
> From new farming equipment and safer drinking water to electric cars and faster microchips, engineers use their knowledge to improve people's lives in meaningful ways.

> **Engineers are creative problem-solvers.[11]**
> They have a vision for how something should work, and are dedicated to making it better, faster or more efficient.

> **Engineers help shape the future.**
> They use the latest science, tools and technology to bring ideas to life.

> **Engineering is essential to our health, happiness and safety.**
> From the grandest skyscrapers to microscopic medical devices, it is impossible to imagine life without engineering.

Despite the fact that these messages tested well across all major audiences (in terms of overall appeal, distinctiveness, clarity, relevance, and believability), we would be wise not to ascribe too much transformative power to them. That is, these messages alone are not going to close the perception gap about engineers and engineering. Any message must be used consistently and creatively as part of a targeted communications program designed to find, reach, motivate and inspire its audiences. (We address this point in greater detail in our discussion of the need for a public awareness campaign, below.)

A New Tagline

In contrast to more straightforward messages, taglines (or slogans) are short, creative expressions, limited to 3-5 words, that are meant to be more emotional in resonance. Typically taglines are used in conjunction with a brand identity or campaign to help distinguish it in the marketplace. Taglines appear with logomarks, or as slogans in advertisements. They acquire equity through their

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[11] The committee expressed some concerns about taking this message to market, in that it might reinforce the notion that engineers are called in primarily to "fix problems" rather than "be innovative." Based on our qualitative research inputs, and our communications experience, we recommend a slight calibration of this message that lands squarely on the note about creativity or innovation: "Engineers create bold new solutions."

repeated, consistent use. Often they are concretely vague, allowing the reader to interpret them to his or her liking. Consider Nike's "Just do it" tagline. ("Just do what?" some may ask.) The statement has come to stand for the company's promise of delivering apparel that inspires us to achieve our best, on and off the field of play.

The best taglines are concise and compelling. They enhance understanding. They help differentiate. They are true to the emotional core. They strategically align with larger communications goals and objectives.

The taglines we developed for this project were developed quickly. They were tested without the benefit of creative prototypes (such as posters or ads), and they were tested solely in a quantitative environment, as compared to a more qualitative setting (such as focus groups) that permits probing and follow-up clarification.

Still, the fact that two initial ideas tested well is a good sign. And each has their respective strengths and weaknesses.

Turning ideas into reality tested well across all survey respondents. It is straightforward and consistent with messaging that the engineering community has used for some time to promote E-Week. This slogan is more descriptive than evocative, speaking very directly of translating creative thinking into practical solutions. Perhaps that is one reason why it scored well as a tagline. Inherently, by itself outside of any additional creative context, it makes the most sense. It's interesting to note, however, that "Turning ideas into reality" was part of the key message, "Engineers connect science to the real world," which was the least appealing of the five tested messages, especially among women.

Although **Because dreams need doing** did not score as highly with adults, it did test well across all audiences, and it tested particularly well with younger women (18-49 year olds), who are both prospective engineers and future mothers of prospective engineers. It also did well among those survey respondents who thought engineering is a good choice versus a bad career choice. Its construction implies a sense of urgency. It cues up the "essentiality" of engineering. It invites us to dream of making a world of difference, underscoring our top-testing message.

For these reasons, our preliminary view is that **Because dreams need doing** would be a more compelling and strategic way to creatively express engineering's new market-tested position.

Toward A Public Awareness Campaign

Now that we have a core set of effective messages, the biggest challenge is implementation. We believe strongly that there should be a united public campaign if the engineering community is serious about shifting public opinion about the field.

Several recent campaigns have demonstrated that seemingly fragmented industries where coordination seemed a distant reality can, in fact, brand themselves and cultivate powerful identities that begin to shift public perceptions. A few examples of recent re-branding initiatives include:

- Chemistry: Essential2Life
- Cotton: The Fabric of Our Lives
- Milk: Got milk?
- Beef: Beef, It's What's for Dinner
- Pork: The Other White Meat

Campaign Attributes

The best communications campaigns share certain attributes. They are strategic, driven by a strong brand position. They are coordinated across many communications channels. They employ diverse messengers. They are supported with dedicated resources. They track metrics and are given time to do their work.

Based on our findings, we recommend that any engineering-community-wide campaign designed to promote engineering consider the following:

Tackle the math issue head-on. Math and science are challenging prerequisites that deserve proper context. They are skills that last a lifetime, that can provide a springboard to other careers, and that give you a powerful awareness of the world around you. But engineering requires many other skills, too, like collaboration and communication.

Show people. Bringing the experience of engineering to life hinges on ascribing authentic and vibrant personality traits to *engineers*. We affiliate with people, not abstract fields of study or career pursuits.

Currently the field lacks a public face. Consider what "starchitects" like Frank Gehry have done for architecture. Or what chefs like Emeril Lagasse have done for gourmet cuisine. Who are the appropriate ambassadors for engineering? They should be diverse, youthful, and articulate experts who have compelling personal stories to share.

Tell stories. The more audiences learn about engineering, the more they like it. Audiences can get how engineering is "all around us" but need to see examples, hear the stories. A successful campaign will elevate interesting examples that have an impact (e.g., wind power, protecting water supply, inventing Xbox, DNA diagnostics). And it will dramatize these stories through creative production efforts (e.g., *Design Squad).*

New visuals. The cliché is true: a picture is worth a thousand words. Engineering makes great TV because it's so visual (witness the popularity of a show like *Modern Marvels*), yet so many images in the marketplace reinforce stale, outdated images of engineers as operators, builders, etc. A robust visual inventory is probably called for, as well as a serious investment in developing a coordinated image gallery.

Treat teens differently. Adolescents require a carefully segmented approach. Boys think engineering is creative, rewarding and that is has a positive effect on people's everyday lives. Girls need more encouragement on these points, especially that the work is rewarding. From the research, we know that boys and girls choose different images and different examples; for example, girls need to see images of young women. And we know that we must skew younger (toward 7-12 years old) to intercept children before perceptions are more fully formed.

Furthermore, for messages to break through the clutter and be effective with youth, we must calibrate our messages for voice, tone and personality. We should use *their* language, not impose *our* language. Language choices have direct bearing on our ability to make an emotional appeal.

Campaign Elements

In execution, effective campaigns are not top-down, monolithic efforts. Advertising is not enough. Awareness campaigns gain traction when directed by a strategic, integrated marketing communications approach. A campaign must reach out on many fronts, to many audiences, in consistently creative ways.

Some of the elements often considered include:

- Corporate partnerships/sponsorships
- Pop culture initiatives: contests, games, books, TV specials, documentary projects
- Educational initiatives: curricula tool kits and guides
- Outreach initiatives: youth, parents, educators, media, etc.
- Related online/offline advertising
- Media training for key ambassadors or spokespeople

A Commitment of Resources

To have a measurable impact, to truly move the needle of public awareness and attitude change, such a campaign likely rolls out in successive years with significant resources behind it. For context, the recent "Got Milk?" campaign targeting teenagers is spending $60MM/year. And the Center for Disease Control's widely promoted anti-obesity campaign — "Verb: It's What You Do" targeting youths 9 to 13 — had budgets of $36 million in 2004 and $59 million in 2005.

It seems the timing for engineering to plan and launch its own awareness campaign could not be better. The launch of the NAE's *Grand Challenges of Engineering* project (www.engineeringchallenges.org) could provide significant fuel for such a campaign. We strongly urge NAE to seize the opportunity by helping the engineering community appoint a streamlined task force to oversee such a campaign, hire a dedicated director to manage it, and retain agency support for creative development, media planning and implementation. At this writing, a conservative estimate would plan on a 2-3 year effort (at a minimum) with expenditures between $12-25MM a year.

The Committee's Final Report

In addition to standard NAE distribution methods, such as a press release, workshop and publication of the final report online, we recommend developing a strategic communications plan to mobilize the engineering community around the committee's final report, when it is developed, and the report's recommendations. This highly targeted communications effort should run 12-18 months and involve a variety of integrated tactics:

- Road show to key stakeholders (associations, firms, media)
- Modular toolkit with talking points and planning guides
- High impact brochure that repackages the report's content with compelling visuals and graphics
- Dedicated microsite with access to tools and guidelines
- Conference workshops, panel discussions and presentations
- Bylined articles, op-eds and media briefings

Appendix A

Roster: Committee on Improving PUE Messaging

Don P. Giddens *Chair*
Dean, College of Engineering
Georgia Institute of Technology

Rick Borchelt
Director of Communications
Genetics and Public Policy Center
Berman Bioethics Center
Johns Hopkins University

Virgil Carter
Executive Director
American Society of Mechanical
Engineers

William S. Hammack
Associate Professor
Department of Chemical Engineering
University of Illinois, Urbana-
Champaign

Leah H. Jamieson
2007 President, Institute of Electrical
and Electronics Engineers (IEEE)
Dean, College of Engineering and
Ransburg Professor of Electrical and
Computer Engineering
Purdue University

James H. Johnson, Jr.
Dean, College of Engineering,
    Architecture & Computer
    Sciences
Howard University

Virginia Kramer
Executive Creative Director
Keiler and Company

Patrick J. Natale
Executive Director
American Society of Civil Engineers

Dietram A. Scheufele
Professor, Department of Life
Sciences Communication, and
School of Journalism & Mass
Communication
University of Wisconsin, Madison

Jacquelyn F. Sullivan
Co-Director, Integrated Teaching
and
    Learning Program
University of Colorado, Boulder

Appendix B

Online Survey Topline Report

QXA1. [IF ADULT] Are you eighteen years of age or over?

	Adults	Informed
Yes	100%	100%
No		

QXT1. [IF TEEN] Are you between the ages of 14 and 17 years of age?

Yes	100%
No	

For each of the following professions or careers someone just starting out in the work world may choose, please indicate whether you think it would be a very good choice, a good choice, a fair choice, or a bad choice as a career or profession.

	GOOD CHOICE		BAD CHOICE		NET	
	Very good	Good	Fair	Bad	GOOD CHOICE	BAD CHOICE
• [IF ADULT] Engineer	56%	33	9	1	90%	10
Informed Adults	61%	32	6	2	92%	8
• [IF ADULT] Doctor	52%	36	9	3	88%	12
Informed Adults	48%	39	9	3	88%	12
• [IF ADULT] Architect...	37%	41	19	2	79%	21
Informed Adults	38%	45	16	2	83%	17
• [IF ADULT] Teacher..	33%	35	24	7	68%	32
Informed Adults	32%	34	26	7	67%	33
• [IF ADULT] Lawyer..	28%	34	25	13	61%	39
Informed Adults	25%	37	24	13	63%	37

For each of the following professions or careers someone like yourself may choose, please indicate whether you think it would be a very good choice, a good choice, a fair choice, or a bad choice as a career or profession.

	GOOD CHOICE		BAD CHOICE		NET	
	Very good	Good	Fair	Bad	GOOD CHOICE	BAD CHOICE
• [IF TEEN] Doctor..	32%	25	21	22	57%	43
• [IF TEEN] Lawyer	30%	27	23	21	56%	44
• [IF TEEN] Engineer...	24%	29	22	25	53%	47
• [IF TEEN] Teacher	24%	33	27	16	57%	43
• [IF TEEN] Architect	18%	30	28	25	47%	53

Q1. Please indicate how important each of the following [IF ADULT] should be to someone starting a career [IF TEEN] is to you in considering which career to get into.

	IMPORTANT			NOT IMPORTANT		NET	
	Extremely	Very	Some	Not that	Not at all	IMPORTANT	NOT IMPORTANT
• Interesting work	48%	42	8	1	*	91	1
Informed Adults	52%	40	8	1	-	92	1
Teens	65%	31	4	*	*	96	*
• Availability of jobs in the field	48%	40	11	1	-	88	1
Informed Adults	40%	47	12	1	-	87	1
Teens	28%	37	24	9	2	65	11
• Work that makes a difference, is meaningful	41%	40	15	4	*	81	4
Informed Adults	42%	41	14	3	*	83	3
Teens	47%	31	18	3	1	78	4
• Challenging work	29%	48	19	3	*	78	3
Informed Adults	33%	48	18	1	1	80	2
Teens	28%	36	28	6	2	64	8
• Salary	26%	45	28	1	*	70	1
Informed Adults	16%	46	36	2	*	62	2
Teens	34%	33	27	6	1	66	6
• Recognition	10%	20	39	23	9	29	32
Informed Adults	8%	16	44	23	10	24	32
Teens	14%	25	37	19	5	39	24
• Prestigious field	9%	15	35	32	9	24	41
Informed Adults	5%	11	37	36	10	16	47
Teens	15%	24	36	20	5	39	25

Q2. On the following one to ten scale, with ten being you know very well what a person in this profession does day-to-day and one being you don't know at all what a person in this profession does day-to-day, please rate your knowledge of each profession.

How well do you know what a person in this profession does day-to-day?

	1	2	3	4	5	6	7	8	9	10	MEDIAN
• Teacher	1%	1	1	2	7	4	12	17	19	35	8.18
Informed Adults	1%	1	1	1	4	6	11	16	24	36	8.40
Teens	1%	1	*	1	2	4	6	15	22	48	8.84
• Doctor	1%	1	3	6	11	10	15	17	13	23	7.35
Informed Adults	1%	2	2	5	9	11	17	17	17	21	7.46
Teens	2%	2	3	5	8	10	17	17	19	17	7.28
• Lawyer	3%	2	7	9	14	9	15	14	11	16	6.65

Q2. On the following one to ten scale, with ten being you know very well what a person in this profession does day-to-day and one being you don't know at all what a person in this profession does day-to-day, please rate your knowledge of each profession.

How well do you know what a person in this profession does day-to-day?

	1	2	3	4	5	6	7	8	9	10	MEDIAN
Informed Adults	1%	2	5	7	11	10	18	17	14	15	6.96
Teens	5%	5	6	7	14	12	13	15	9	13	6.33
• Engineer	6%	8	10	8	17	9	12	11	10	9	5.75
Informed Adults	4%	6	10	6	16	10	14	14	10	11	6.12
Teens	11%	12	12	12	14	12	8	7	7	5	4.86
• Architect	6%	8	8	9	18	10	16	10	8	7	5.66
Informed Adults	5%	8	7	7	16	13	19	11	7	7	5.83
Teens	9%	12	13	10	15	12	11	9	4	5	4.99
• Scientist	10%	9	9	9	16	12	10	10	7	8	5.34
Informed Adults	7%	9	7	9	15	13	12	11	8	8	5.64
Teens	7%	9	10	12	15	11	13	10	8	6	5.46

Q3. Thinking about the field of engineering what words come to mind when you see or hear the word ENGINEERING?

	Adults	Informed	Teens
Builders/buildings/construction/bridges	22%	22%	16%
Math/numbers/physics/computers/science	12	16	21
Design	11	11	7
Mechanic/machines/industrial	6	6	13
Smart/skilled	5	5	1
Invention/innovation/creative	5	6	3
Problem solving	3	3	2
Planner/Planning	3	2	1
Negative attributes (nerdy/boring)	3	4	2
Electrical/electronics	3	2	3
Complicated/complex/difficult	3	3	2
Cars/Automotive/Trains	2	1	7
Technology	2	2	2
Civil Engineering	2	2	1
Making things/Manufacturing	2	2	2
Precise/careful/meticulous	1	3	*
Chemical	1	1	1
Worthwhile/Interesting Job	1	*	-
Energy (oil, nuclear)	1	1	1
Airplanes/space/NASA	1	1	2
Corporations (e.g. GE, General Motors)	1	1	*
Foreigners/International jobs/outsourcing	*	1	*
Parents/Someone they know	*	*	2
Army Corps	*	*	-
Safety	*	1	-
Good-paying job	*	1	1
University (e.g. Georgia Tech, MIT)	*	*	1
Interesting	*	*	*
Biomedical	*	*	*
Engines	-	-	2
Dilbert	-	-	*
Don't Know/Not Sure	3	2	1
Other	4	1	4

Q4. For each of the following, please indicate how well you think it describes engineers or the field of engineering.

	WELL		NOT WELL		NET	
	Very	Some	Not that	Not at all	WELL	NOT WELL
• [FORM B] Must be good at math and science	86%	13	1	-	99%	1
Informed Adults	86%	13	1	-	99%	1
Teens	84%	14	2	-	98%	2
• [FORM B] Designs, draws and plans things	61%	33	4	2	95%	5
Informed Adults	59%	35	4	2	94%	6
Teens	63%	31	6	1	93%	7
• [FORM A] Problem solvers	59%	36	3	3	95%	5
Informed Adults	71%	26	2	*	97%	3
Teens	62%	32	5	1	94%	6
• [FORM A] Builds, constructs and makes things	53%	38	7	2	91%	9
Informed Adults	57%	35	8	*	92%	8
Teens	59%	33	7	1	92%	8
• [FORM A] Creative	45%	48	5	3	92%	8
Informed Adults	49%	44	5	3	92%	8
Teens	47%	37	14	2	84%	16
• [FORM B] Well-paid	44%	51	5	1	95%	5
Informed Adults	42%	51	6	1	93%	7
Teens	46%	44	8	2	90%	10
• [FORM B] Get results	44%	45	10	1	89%	11
Informed Adults	37%	53	9	2	90%	10
Teens	42%	50	7	1	92%	8
• [FORM A] Must be smart to get into this field	43%	43	9	4	87%	13
Informed Adults	47%	45	7	1	92%	8
Teens	56%	35	6	3	91%	9
• [FORM B] Original thinkers	43%	44	11	2	88%	12
Informed Adults	40%	46	13	1	86%	14
Teens	45%	45	9	1	90%	10
• [FORM A] Hard working	42%	47	10	1	88%	12
Informed Adults	41%	53	5	2	93%	7
Teens	62%	33	5	*	95%	5
• [FORM B] Well-respected	39%	49	11	1	88%	12
Informed Adults	34%	54	11	1	87%	13
Teens	34%	48	17	2	81%	19
• [FORM B] The work is rewarding	36%	48	14	2	84%	16
Informed Adults	37%	48	14	1	85%	15
Teens	32%	44	20	3	77%	23
• [FORM B] Mostly men	35%	45	16	3	80%	20
Informed Adults	38%	47	13	3	84%	16

Q4. For each of the following, please indicate how well you think it describes engineers or the field of engineering.

	WELL		NOT WELL		NET	
	Very	Some	Not that	Not at all	WELL	NOT WELL
Teens	37%	43	15	5	80%	20
• [FORM B] Have a positive effect on peoples' everyday lives	32%	50	16	2	82%	18
Informed Adults	38%	45	15	2	83%	17
Teens	36%	42	17	4	78%	22
• [FORM A] Inventors	28%	54	15	3	82%	18
Informed Adults	33%	50	15	2	83%	17
Teens	41%	42	12	4	84%	16
• [FORM B] Leaders	23%	45	28	5	67%	33
Informed Adults	19%	40	37	5	59%	41
Teens	22%	43	30	5	65%	35
• [FORM B] Often work outdoors	17%	35	39	8	53%	47
Informed Adults	13%	38	39	11	50%	50
Teens	20%	35	33	12	55%	45
• [FORM B] Entrepreneurial	12%	36	41	10	48%	52
Informed Adults	11%	33	45	11	44%	56
Teens	18%	37	33	12	55%	45
• [FORM A] Mostly white	12%	33	38	17	45%	55
Informed Adults	15%	35	35	14	50%	50
Teens	11%	34	32	23	45%	55
• [FORM A] Requires too many years of school to get a degree	10%	25	49	16	35%	65
Informed Adults	8%	24	49	19	32%	68
Teens	15%	27	38	20	42%	58
• [FORM A] Starts new companies	7%	32	50	11	39%	61
Informed Adults	7%	37	45	12	43%	57
Teens	14%	42	34	10	56%	44
• [FORM A] Fun	7%	51	30	11	58%	42
Informed Adults	9%	48	34	9	57%	43
Teens	9%	44	35	13	52%	48
• [FORM A] Nerdy	5%	23	43	30	27%	73
Informed Adults	6%	31	37	26	37%	63
Teens	14%	24	40	22	39%	61
• [FORM A] Boring	4%	16	46	34	20%	80
Informed Adults	4%	15	48	32	19%	81
Teens	12%	24	35	29	36%	64
• [FORM A] Sits at a desk all day	2%	25	52	20	27%	73
Informed Adults	4%	29	46	21	33%	67
Teens	6%	23	43	28	30%	70

Q5. For the following examples of engineering, please indicate how appealing it is. In other words, how well does it create interest for you in engineering? If you don't think it is a good example of engineering, please indicate that.

	APPEALING		NOT APPEALING			NET	
	Very	Somewhat	Not that	Not at all	Not good example	APPEALING	NOT APPEALING
• [FORM B] Machines that allow blind people to see..........	60%	30	6	1	3	90	7
Informed Adults	64%	28	4	3	1	92	7
Teens	48%	33	12	4	3	82	16
• [FORM B] Building cars that run on alternative fuels	58%	33	7	2	1	91	9
Informed Adults	66%	26	5	2	1	92	7
Teens	51%	29	13	6	1	80	18
• [FORM B] Protecting the water supply.................................	54%	29	10	3	3	84	13
Informed Adults	54%	33	9	3	2	87	11
Teens	37%	34	18	7	3	72	25
• [FORM B] Wind power..	48%	35	12	3	2	83	15
Informed Adults	55%	28	12	3	2	84	15
Teens	29%	35	22	12	2	64	34
• [FORM B] Protecting the rainforest by developing new ways to farm that don't require so much land..................	47%	29	10	5	7	77	16
Informed Adults	51%	28	6	6	8	80	13
Teens	40%	33	14	11	3	73	25
• [FORM A] Creating more advanced M.R.I. machines to do better brain and body scans to diagnose health problems..	47%	39	9	2	3	86	11
Informed Adults	50%	39	6	5	*	89	11
Teens	32%	37	18	8	4	69	27
• [FORM A] Solar energy...	47%	35	13	1	4	82	14
Informed Adults	58%	28	12	2	*	86	13
Teens	34%	32	21	8	5	66	29
• [FORM A] Making cars safer	43%	40	14	2	*	84	16
Informed Adults	45%	41	11	2	1	86	13
Teens	31%	40	21	6	2	71	27
• [FORM A] Using D.N.A. evidence to solve crimes............	42%	29	11	3	15	71	14
Informed Adults	47%	24	11	3	15	71	14
Teens	43%	28	13	7	10	71	20
• [FORM A] Reducing air pollution...	40%	35	18	3	4	75	21
Informed Adults	48%	30	18	4	1	78	22
Teens	33%	34	22	7	5	67	29
• [FORM A] Making homes safer	40%	45	11	2	2	84	14
Informed Adults	40%	41	14	4	1	82	18
Teens	27%	36	29	6	2	63	35

Q5. For the following examples of engineering, please indicate how appealing it is. In other words, how well does it create interest for you in engineering? If you don't think it is a good example of engineering, please indicate that.

	APPEALING		NOT APPEALING			NET	
	Very	Somewhat	Not that	Not at all	Not good example	APPEALING	NOT APPEALING
• [FORM B] Space exploration	40%	35	13	10	3	74	23
Informed Adults	45%	32	13	8	2	77	21
Teens	45%	30	16	7	3	75	23
• [FORM B] Smart traffic solutions	38%	35	18	6	3	73	24
Informed Adults	41%	37	18	3	2	78	21
Teens	28%	28	28	14	2	56	42
• [FORM B] Turning deserts into farmland	37%	34	19	6	3	72	25
Informed Adults	40%	36	11	10	3	75	21
Teens	25%	33	22	14	5	58	36
• [FORM A] Missile defense systems	37%	35	15	11	3	72	26
Informed Adults	37%	27	17	16	3	64	33
Teens	30%	26	20	20	4	56	40
• [FORM B] D.N.A. testing	34%	27	18	8	13	61	26
Informed Adults	35%	30	16	6	13	65	22
Teens	34%	32	17	8	8	67	25
• [FORM A] Designing the world's fastest plane	34%	35	21	9	1	70	30
Informed Adults	36%	32	22	9	*	68	32
Teens	31%	34	19	14	3	64	33
• [FORM A] Making smaller, faster computer processor	34%	39	19	4	4	72	24
Informed Adults	33%	42	17	8	*	75	25
Teens	34%	30	17	17	2	64	34
• [FORM B] Growing organs for transplants	32%	26	18	10	15	58	27
Informed Adults	36%	25	16	6	16	61	23
Teens	35%	24	17	13	11	59	30
• [FORM B] Building an acoustically-perfect concert hall	27%	38	18	14	3	65	32
Informed Adults	32%	39	16	10	3	71	26
Teens	29%	26	29	13	3	55	42
• [FORM B] Building the world's longest bridge	26%	37	23	10	4	63	33
Informed Adults	32%	33	23	9	3	65	32
Teens	25%	30	23	18	4	55	41
• [FORM B] Developing new foods	24%	29	22	15	10	53	37
Informed Adults	21%	31	25	13	11	52	37
Teens	25%	25	29	11	10	51	40
• [FORM A] High-definition television	20%	40	25	9	6	60	34
Informed Adults	22%	38	25	12	3	60	37

Q5. For the following examples of engineering, please indicate how appealing it is. In other words, how well does it create interest for you in engineering? If you don't think it is a good example of engineering, please indicate that.

	APPEALING		NOT APPEALING			NET	
	Very	Somewhat	Not that	Not at all	Not good example	APPEALING	NOT APPEALING
Teens	28%	27	22	17	6	55	40
• [FORM A] Designing video games	19%	29	24	18	10	48	42
Informed Adults	19%	23	22	26	10	42	48
Teens	38%	28	16	13	5	66	29
• [FORM A] Developing new fabrics	13%	31	33	14	9	44	47
Informed Adults	16%	28	35	15	6	44	50
Teens	13%	24	32	21	10	37	53
• [FORM A] iPod	13%	28	30	16	13	41	45
Informed Adults	18%	29	27	18	8	47	45
Teens	34%	31	16	10	8	65	27
• [FORM B] Velcro	11%	23	38	14	14	34	52
Informed Adults	13%	30	34	12	11	43	46
Teens	12%	15	34	24	15	26	58

On the following pages you will read some statements that people have made about engineering. After you read each statement, please answer the questions below. Please press "Next" to continue.

Q6A. Engineers are creative problem-solvers. They have a vision for how something should work, and are dedicated to making it better, faster or more efficient.

How appealing this statement is to you, personally?

	Adults	Informed	Teens
Very appealing	52%	53%	42%
Somewhat appealing	38	35	41
Not that appealing	9	10	15
Not appealing at all	1	2	2
NET APPEALING	90%	88	83
NET NOT APPEALING	10	12	17

Q6B. How believable is this statement?

	Adults	Informed	Teens
Very believable	58%	60%	53%
Somewhat believable	35	33	41
Not that believable	6	7	6
Not believable at all	*	1	1
NET BELIEVABLE	93%	92	93
NET NOT BELIEVABLE	7	8	7

Q6C. How much do you, personally, care about what this statement says and the examples included in it?

	Adults	Informed	Teens
Care very much	32%	33%	26%
Care somewhat	47	47	45
Don't care that much	17	16	21
Don't care at all	4	4	8
NET CARE	79%	80	71
NET DON'T CARE	21	20	29

Q7A. Engineers connect science to the real world. They collaborate with scientists and other specialists [SUCH AS ANIMATORS, ARCHITECTS OR CHEMISTS] to turn bold new ideas into reality.

How appealing this statement is to you, personally?

	Adults	Informed	Teens
Very appealing	42%	46%	35%
Somewhat appealing	43	44	42
Not that appealing	12	10	18
Not appealing at all	2	1	5
NET APPEALING	86%	90	77
NET NOT APPEALING	14	10	23

Q7B. How believable is this statement?

	Adults	Informed	Teens
Very believable	49%	52%	46%
Somewhat believable	42	42	47
Not that believable	8	5	6
Not believable at all	1	1	1
NET BELIEVABLE	91%	94	93
NET NOT BELIEVABLE	9	6	7

Q7C. How much do you, personally, care about what this statement says and the examples included in it?

	Adults	Informed	Teens
Care very much	28%	30%	21%
Care somewhat	48	48	45
Don't care that much	20	18	27
Don't care at all	5	4	7
NET CARE	75%	78	66
NET DON'T CARE	25	22	34

Q8A. Engineering is essential to our health, happiness and safety. From the grandest skyscrapers to microscopic medical devices, it is impossible to imagine life without engineering.

How appealing this statement is to you, personally?

	Adults	Informed	Teens
Very appealing	48%	49%	35%
Somewhat appealing	36	39	42
Not that appealing	14	11	18
Not appealing at all	2	1	5
NET APPEALING	84%	87	78
NET NOT APPEALING	16	13	22

Q8B. How believable is this statement?

	Adults	Informed	Teens
Very believable	57%	57%	50%
Somewhat believable	35	36	39
Not that believable	7	6	9
Not believable at all	*	1	2
NET BELIEVABLE	92%	93	89
NET NOT BELIEVABLE	8	7	11

Q8C. How much do you, personally, care about what this statement says and the examples included in it?

	Adults	Informed	Teens
Care very much	38%	37%	31%
Care somewhat	42	42	41
Don't care that much	16	19	20
Don't care at all	4	3	8
NET CARE	80%	79	72

	NET DON'T CARE	20	21	28

Q9A. Engineers help shape the future. They use the latest science, tools and technology to bring ideas to life.

How appealing this statement is to you, personally?

	Adults	Informed	Teens
Very appealing	48%	53%	37%
Somewhat appealing	40	38	43
Not that appealing	11	9	17
Not appealing at all	1	1	3
NET APPEALING	88%	90	80
NET NOT APPEALING	12	10	20

Q9B. How believable is this statement?

	Adults	Informed	Teens
Very believable	56%	56%	48%
Somewhat believable	39	39	44
Not that believable	5	4	6
Not believable at all	*	1	1
NET BELIEVABLE	95%	96	93
NET NOT BELIEVABLE	5	4	7

Q9C. How much do you, personally, care about what this statement says and the examples included in it?

	Adults	Informed	Teens
Care very much	33%	34%	25%
Care somewhat	46	46	43
Don't care that much	18	16	24
Don't care at all	4	4	8
NET CARE	78%	80	68
NET DON'T CARE	22	20	32

Q10A. Engineers make a world of difference. From new farming equipment and safer drinking water to electric cars and faster microchips, engineers use their knowledge to improve people's lives in meaningful ways.

How appealing this statement is to you, personally?

	Adults	Informed	Teens
Very appealing	55%	56%	43%
Somewhat appealing	36	38	41
Not that appealing	8	5	11
Not appealing at all	2	1	4
NET APPEALING	90%	94	85
NET NOT APPEALING	10	6	15

Q10B. How believable is this statement?

	Adults	Informed	Teens
Very believable	57%	59%	54%
Somewhat believable	37	39	40
Not that believable	6	2	6
Not believable at all	*	*	1
NET BELIEVABLE	94%	97	94
NET NOT BELIEVABLE	6	3	6

Q10C. How much do you, personally, care about what this statement says and the examples included in it?

	Adults	Informed	Teens
Care very much	41%	40%	31%
Care somewhat	41	45	45
Don't care that much	15	11	18
Don't care at all	3	3	6
NET CARE	82%	86	76

| | | | | NET DON'T CARE | 18 | 14 | 24 |

Q11. And of these statements, which is most appealing to you, personally?

	Adults	Informed	Teens
Engineers make a world of difference. From new farming equipment and safer drinking water to electric cars and faster microchips, engineers use their knowledge to improve people's lives in meaningful ways.	31%	31%	28%
Engineers are creative problem-solvers. They have a vision for how something should work, and are dedicated to making it better, faster or more efficient.	22	21	23
Engineers help shape the future. They use the latest science, tools and technology to bring ideas to life.	19	19	16
Engineering is essential to our health, happiness and safety. From the grandest skyscrapers to microscopic medical devices, it is impossible to imagine life without engineering.	16	16	19
Engineers connect science to the real world. They collaborate with scientists and other specialists (such as animators, architects or chemists) to turn bold new ideas into reality.	12	13	14

Q12. And of these statements, which is least appealing to you, personally?

	Adults	Informed	Teens
Engineers connect science to the real world. They collaborate with scientists and other specialists (such as animators, architects or chemists) to turn bold new ideas into reality.	30%	25%	26%
Engineering is essential to our health, happiness and safety. From the grandest skyscrapers to microscopic medical devices, it is impossible to imagine life without engineering.	20	22	21
Engineers are creative problem-solvers. They have a vision for how something should work, and are dedicated to making it better, faster or more efficient.	20	18	18
Engineers help shape the future. They use the latest science, tools and technology to bring ideas to life.	18	22	20
Engineers make a world of difference. From new farming equipment and safer drinking water to electric cars and faster microchips, engineers use their knowledge to improve people's lives in meaningful ways.	12	12	14

Q13. The following are some taglines or slogans that might be used to describe engineering. Please indicate how appealing that tagline or slogan is to you, personally.

	APPEALING		NOT APPEALING		NET	
	Very	Somewhat	Not that	Not at all	APPEALING	NOT APPEALING
• Turning ideas into reality.	49%	43	8	1	92	8
Informed Adults	46%	43	9	2	90	10
Teens	48%	36	12	3	84	16
• Because dreams need doing.	26%	36	27	12	61	39
Informed Adults	24%	32	32	11	56	44
Teens	42%	31	20	6	73	27

Q13. The following are some taglines or slogans that might be used to describe engineering. Please indicate how appealing that tagline or slogan is to you, personally.

	APPEALING		NOT APPEALING		NET	
	Very	Somewhat	Not that	Not at all	APPEALING	NOT APPEALING
• Designed to work wonders.	23%	42	25	9	65	35
Informed Adults	20%	38	31	10	58	42
Teens	25%	42	24	10	67	33
• Life takes engineering.	21%	37	31	11	58	42
Informed Adults	20%	37	32	11	58	42
Teens	19%	34	32	15	53	47
• The power to do.	21%	44	24	11	65	35
Informed Adults	20%	40	28	12	60	40
Teens	31%	37	24	8	67	33
• Bolder by design.	17%	43	29	10	60	40
Informed Adults	18%	39	31	11	57	43
Teens	26%	35	29	10	61	39
• Behind the next big thing.	15%	32	39	14	47	53
Informed Adults	14%	32	40	13	47	53
Teens	23%	35	31	11	58	42

D101A. [IF ADULT] What is your age?

	Adults	Informed
18-24	8%	4%
25-34	9	13
35-44	27	30
45-54	20	20
55-64	17	15
65+	18	19

D101T. [IF TEEN] What is your age?

14	20%
15	27
16	27
17	27

QXT2. [IF TEEN] When you graduate high school, how likely is it that you will attend college?

Definitely will attend college	82%
Probably will attend college	11
Chances are 50-50	6
Probably not	1
Definitely not	-

D102. [IF ADULT] What is the last grade that you completed in school?

	Adults	Informed
Some grade school	*	-
Some high school	6	-
Graduated high school	39	-
Technical/Vocational	3	-
Some college	25	48
Graduated college	17	33

Graduate professional 10   20

D103. **[IF ADULT]** Generally speaking, how much attention do you pay to the news, including what's happening local, statewide, or nationally?

	Adults	Informed
A great deal	64%	75%
Some	28	24
A little...	6	1
Not very much	2	1
Not at all	1	-
NET PAY ATTENTION...	92%	99
NET DON'T PAY ATTENTION......................................	3	1

D104. **[IF ADULT]** Generally speaking, how involved are you in your community as a volunteer -- a great deal, some, a little, not very much?

	Adults	Informed
Very involved..	9%	11%
Somewhat involved	24	29
A little involved	22	23
Not very involved...	27	25
Not involved at all	18	12
NET INVOLVED	33%	39
NET NOT INVOLVED	45	38

D107. **[IF ADULT]** Do you currently have any children under 18 living at home with you?

	Adults	Informed
Yes	35%	34%
No..	65	66

D108. **[IF ADULT]** What is your current or most recent occupation?

[CODED RESPONSES TO FOLLOW]

D100. What is your gender?

	Adults	Informed	Teens
Male	48%	53%	46%
Female..	52	47	54

D300. And just to make sure we have a representative sample of Americans, could you please tell me your race?

	Adults	Informed	Teens
Black/African-American	6%	7%	7%
White/Caucasian..	84	81	79
Hispanic/Latino	3	5	5
Asian-American	1	*	7
Other (SPECIFY)..	7	7	4

D400. What state do you live in?

	Adults	Informed	Teens
East..	19%	16%	18%
Midwest...	24	20	22
South..	33	35	36
West...	24	29	24