RK&A

IMPACT PLANNING • EVALUATION • AUDIENCE RESEARCH

SUMMATIVE EVALUATION:

PLACES OF INVENTION EXHIBITION

Prepared for the
Lemelson Center for the Study of Invention and Innovation,
National Museum of American History, Smithsonian Institution
Washington, DC

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Randi Korn & Associates, Inc. conducted a summative evaluation of *Places of Invention* (*POI*) exhibition for the Lemelson Center for the Study of Invention and Innovation at the National Museum of American History (NMAH). In the pages that follow, we present and discuss the most salient findings. See the findings section for a comprehensive presentation of results.

BACKGROUND INFORMATION

Methods:

- 100 timing & tracking observations
- 124 interviews among control & 2 treatment groups

Visitors:

- Random selection of visitors 10 years & older
- 60% are first-time visitors to NMAH
- 90% are US residents

EXHIBITION EXPERIENCES

Overall Visitation:

- Short dwell time, median time = 6 min:30 sec
- Low Usage, median stops = 9 (of 63)

Sections Visited:

- Silicon Valley has high visitation & dwell time
- Fort Collins has low visitation & dwell time

The Hub:

- Low visitation and usage
- 1% of all *POI* visitors submit story

ACHIEVEMENT OF OUTCOMES

Outcome 1: Visitors identify the 21st century skills that inventors practice.	**High achievement overall but not effected by *POI*:** ♦ 92% scored at top half of continuum for control/ treatment measure. ♦ 74% scored in top half on treatment-only measure.
Outcome 2: Visitors identify characteristics that support innovative communities.	**High achievement overall and measured positive impact from *POI*:** ♦ 74% scored at top half of continuum for control/treatment measure, and *POI* positively impacted achievement. ♦ 61% scored at top half on treatment-only measure.
Outcome 3: Visitors express interest in learning about inventions and/or inventors.	**Moderate achievement overall but not effected by *POI*:** ♦ 70% scored at top half of continuum on the control/treatment measure. ♦ 11% spent more than 4 minutes with at least one interactive.
Outcome 4: Visitors see places around them as potential hot spots of invention.	**Moderate achievement but not effected by *POI*** ♦ 56% scored at top half of continuum on the control/treatment measure
Outcome 5: Visitors see themselves as inventive.	**Moderate achievement but not effected by *POI*** ♦ 41% scored at top half of continuum on the control/treatment measure.

DISCUSSION

Randi Korn & Associates, Inc. (RK&A) conducted a rigorous summative evaluation for the NSF-funded *Places of Invention* (*POI*) exhibition at the National Museum of American History (NMAH). The exhibition was designed by Roto with the Lemelson Center for the Study of Invention and Innovation. The exhibition proved to have impact on one of the five outcomes. The following discussion focuses on the exhibition's achievement of its outcomes, describing the successes and shortcomings of the exhibition.

SUMMARY OF IMPACT

POI impact was measurable on one indicator (orange highlights)

OUTCOMES	INDICATORS	ACHIEVEMENT (%at top half of rubric)
1. Visitors identify the 21st century skills that inventors practice.	a. Visitors name at least two skills applied by inventors using vocabulary from the exhibition.	92%
	b. Visitors associate at least one skill from the exhibition with at least one featured place.	74%
2. Visitors identify characteristics that support innovative communities.	**a. Visitors describe characteristics that support(ed) an inventive place.**	**74%** ***POI Impact**
	b. Visitors identify characteristics of featured places in the exhibition that supported invention.	61%
3. Visitors express interest in learning about inventions and/or inventors.	a. Visitors are interested in learning about inventions/inventors.	70%
	b. Visitors spent 4 minutes or more at one interactive or more.	11%
4. Visitors see places around them as potential hot spots of invention.	a. Visitors see places around them as potentially inventive.	56%
5. Visitors see themselves as inventive.	a. Visitors think of themselves as inventive	41%

BACKGROUND

Before describing achievement on outcomes, it is important to discuss visitors' experiences in the exhibition. Overall time spent in the *POI* exhibition is relatively short; the median time spent by visitors 10 years and older is 6 minutes 30 seconds. By comparison, the median time spent in *Invention at Play* by visitors 6 years and older is 10 minutes 11 seconds.

The usage of the *POI* exhibition is also fairly low, with visitors stopping at a median of 9 of the 63 available components in the exhibition. However, in interviews, visitors reported being content with their *POI* experience. Specific featured places were a primary factor that contributed to visitors' enjoyment in combination with the availability of interactive exhibits. While a few lamented that more in-depth content was not available, this was not a trend, and years of visitor studies have shown that visitor comments for "more" are often misstated. We have realized over time that what people mean is that they want is a certain *type of information* versus more, or they default to asking for more when invited to indicate what they like least or what could be improved. In fact, several praised the exhibition because it was "not overwhelming" and allowed them to visit those parts of the exhibition that piqued their interest. While depth of engagement may be disappointing to curators and designers, the exhibition seemed well-suited to NMAH visitors' capacity (and for Smithsonian visitors in general who often visit more than one museum in a day or within the week).

APPRECIATION OF DESIGN

I thought it was kind of nice. You were able to kind of walk through. You didn't really need to spend too much time, but then if you wanted to you could…. And I like the way it was segmented, because again, if it was something that you were interested in you could go and see it. And if not, you could walk on to the next one. The film thing really grabbed me. The medical one is what grabbed him, and so you were just able to you know go into what interested you.
-45-year-old woman & 17-year-old boy

OUTCOME 1

Outcome 1 states: "Visitors identify the 21st century skills that inventors practice." To support this outcome, there were six particular skills that were highlighted in the exhibition at Skill Spots. The Skill Spots, which were all drafted to reflect the skill in a particular place, include:

- Adaptability – featured at the Bronx and Hartford
- Collaboration – featured at Medical Alley and Silicon Valley
- Communication – featured at the Bronx and Hartford
- Creativity – featured at Hollywood
- Problem-solving – featured at Fort Collins
- Risk-taking – featured at Medical Alley

The study reveals that visitors are already inclined to think about these skills in relationship to inventors (92 percent of visitors scored at the top half of the continuum for Indicator 1a and there were no differences between control and treatment group). Not surprisingly, creativity is the skill the most visitors are familiar with (72 percent named it as a skill of inventors), so there was little room for visitors to show deepening of awareness or understanding in that area. However, all other skills were mentioned by less than one-quarter of visitors so there is potential to deepen visitors understanding of those skills.

From visitor observations, we know that each of Skill Spot was visited by 11 percent of visitors or fewer, providing little exposure. Skills are sometimes reiterated in the intro panels, (e.g., risk-taking and collaboration are mentioned under the "Place" section of the Medical Alley intro panel) and sometimes in the videos, but they could be emphasized more prominently in frequently visited components, such as interactives, for greater impact.

PERCEIVED IMPORTANCE OF SKILLS

I liked the skills spots. Adaptability, each one of those when you came out or as you went in. That's for all ages, not just children. I'm a college professor, and I took a picture of one of them. . . . . I could create PowerPoints with those skill spots—collaboration, adaptability—I like that. . . . the question it asks at the end, "Have you ever done this, or do you know some people who have helped you do this?"
- 65 year-old woman

OUTCOME 2

Outcome 2 states: "Visitors identify characteristics that support innovative communities." Characteristics that support innovative communities are emphasized most strongly in the "Place" section of the intro panels for each place as well as in the "Why Here, Why Now" videos.

Findings from the study show that achievement is fairly high overall and, more importantly, that *POI* positively impacted achievement. That is, the majority of those who visited *POI* were able to identify two or more characteristics that support innovative communities (53 percent of Treatment A and 57 percent of Treatment B interviewees) whereas only half as many visitors who had not seen *POI* were able to do so (26 percent of Control interviewees).

The unique concept of the exhibition was the driving force behind the success on this outcome. The concept is novel and no visitors had encountered it before. The exhibition design in general, with distinct pods dedicated to different places, reinforce the concept of innovative communities, and the messaging within sections supporting that there is a unique mix of features that support invention in a particular place at a moment in time.

ECOSYSTEM OF INVENTION

I thought the focus on the different places was really interesting. I think all too often there is a biography of an individual–and the idea that there are sort of ecosystems where invention happened in a particular moment in time was a neat approach. I think that also fit well with the way that they had identified different constellations of people that were involved, which was really good, too because that gets away from the great man, name, and date timeline kind-of-thing.
- 30-year-old man

OUTCOME 3

Outcome 3 states: "Visitors express interest in learning about inventions and/or inventors." Because visitors have a relatively high interest in invention overall (70 percent of visitors scored at top half of continuum on the control/treatment measure for interest on Indicator 3a), it is not surprising that *POI* did not impact interest (i.e., little room to grow). Plus, the pervasiveness of invention in pop culture (several mentioned the TV show *Shark Tank* and others referred to the TV show *Silicon Valley* and books and films about Steve Jobs) likely influenced their level of interest beyond how the one-time museum experience might.

Note that another indicator (3b) was used to explore visitors' interest in invention through their engagement with the interactives in the exhibition. Just 11 percent of visitors spent more than 4 minutes with at least one interactive, with 4 minutes being the time initially benchmarked for success when the exhibition was first conceptualized. However, the interactives in the exhibition were not designed for extended dwell times. The few interactives that engaged visitors for over 4 minutes include Hub Kiosk, which requires time for visitors to think about and submit a story, and the Silicon Valley Icon Design interactive and Bronx Turntable interactive, which provide visitors space to experiment. By comparison, at least two of the other three interactives, Hartford Manufacturing interactive and Hollywood Technicolor interactive, required much less time; for instance, the Hollywood Technicolor interactive provided an a-ha moment for some but required only flipping three sheets of film. Therefore, we encourage the exhibition team to reflect internally on the success of the interactive in light of how the project evolved.

OUTCOME 4 & 5

Outcome 4 and 5 both relate to perception. Outcome 4 states: "Visitors see places around them (personal work & learning spaces, schools, neighborhoods, universities, & industries) as potential hot spots of invention"; and Outcome 5 states: "Visitors see themselves as inventive." Achievement on both was moderate (56 percent scored at top half of continuum on the indicator for Outcome 4, and 41 percent scored at the top half of the continuum on Outcome 5); the exhibition had no measurable impact on either outcome.

In general, perceptions are difficult to change. For example, when confronted with the question of whether they perceive themselves as inventive, visitors were reluctant to use the word "inventive" to describe themselves, even if they considered themselves tinkerers or problem solvers; responses were often accompanied by laughter as well. Similarly, on Outcome 4, visitors often paused and some seemed hesitant to identify their place of residence as a place of invention. The strategies the exhibition team employed to support these outcomes were prudent, such as including questions in Skill Spots that asks visitors to think about moments in their lives when they experienced problems similar to the communities of invention featured and asking visitors to contribute their own place-stories of invention to the Hub Map. Yet, the components that are intended best support these outcomes are some of the most underutilized.

The exhibition team might consider the relative importance of these two outcomes to the exhibition to determine if remediation to the exhibition (and to what level of effort) might be appropriate.

CONCLUSION

Achieving impact is a difficult, and often times, an exhibition or program will only have impact on one or two of its intended outcomes (if any). *POI* is similar to other exhibitions and programs in this way. Nevertheless, while achievement was only measurable on one outcome, it was the outcome of greatest significance to the exhibition's theme. As acknowledged by visitors, the concept behind *POI* was different from what they normally expect to see in an exhibition on invention. Taking risks and providing a new lens through which visitors can think about a topic is essential to the work of a museum in our opinion, and we congratulate the exhibition team in bringing forth a conceptually strong exhibition even if it did not meet all of its intended outcomes.

RECOMMENDATIONS

If funds are available for remediation, NMAH might:

- **Use words that call out skills in the interactives (to support Outcome 1).** The interactives are among the most visited components and thus provide a great opportunity to support skill development and/or recognition. While fully redesigning the interactives would require far too much time and resources, there may be simple ways to better emphasize skills within the current designs. For instance, the current instructions at the Workshop/Surgery Table interactive read "work together", but they could instead say "collaborate" to draw explicit links between highlighted "Skill Spots" in the Medical Alley section and the interactive.
- **Use concrete language to explicitly link skills with being inventive** (**to support Outcome 5)**. Potentially change the name of the "Skill Spots" to "Inventor Skills" or "Skills for Inventiveness"—language that explicitly links the highlighted skills to being inventive. Also, consider adding a lead question or header that reads, "How are you inventive?" or "How are you like an inventor?" before the other questions at the bottom of the Skill Spot (e.g., on the Collaboration Skill Spot in Silicon Valley, add a header or lead question before "Have you ever shared your knowledge with a friend or colleague and received a good idea in return?")
- **Explicitly invite visitors to explore Map Content by adding directives to the Hub Map.** For example, include a prompt on the Map's frame or to the touchscreen's attract screen reading "touch to explore places of invention."

- **Consider presenting a visitor-generated example story to encourage use of and boost the quality of submissions at the Hub Kiosk**. An example story could be presented on the Hub Kiosk table (which may also help attract visitors to the Kiosk) or on the touchscreen (before prompting visitors to submit their own story).
- **Move content on the Meeting Place Boards into plain sight in the Hub**. For example, transfer content to a text panel or video screen widely visible to anyone sitting or standing in the Hub.
- **Reframe the instructions on the Bronx Turntable interactive**. A few visitors said the interactive lacked focused directions or feedback, so consider how to better align visitors' expectations with the experience. Perhaps replacing the text "learn how to scratch" with "try scratching" will help cue visitors that the experience is open-ended and will not provide specific feedback on their scratching abilities.

STUDY BACKGROUND

The Lemelson Center for the Study of Invention and Innovation and the National Museum of American History (NMAH) contracted Randi Korn & Associates, Inc. (RK&A) to conduct a summative evaluation of the *Places of Invention* (*POI*) exhibition, which was funded by the National Science Foundation and designed in partnership with Roto. The evaluation was designed to determine the extent to which the exhibition achieved its goals as stated in its impact framework below.

Outcomes	Indicators
1. Visitors identify the 21st century skills that inventors practice.	1a. Visitors name at least two skills applied by inventors using 21st Century Skills vocabulary as articulated in the exhibition (creativity, flexibility, adaptability, risk-taking, collaboration, communication, and problem-solving).
	1b. Visitors associate at least one skill from the exhibition with at least one featured place in the exhibition.
2. Visitors identify characteristics that support innovative communities.	2a. Visitors describe characteristics that support(ed) an inventive place.
	2b. Visitors identify characteristics of featured places in the exhibition that supported invention.
3. Visitors express interest in learning about inventions and/or inventors.	3a. Visitors express interest in invention (learning about inventions and/or inventors).
	3b. Visitors spend at least four minutes engaged in one of the interactive activities in the exhibition and/or on the map.
4. Visitors see places around them (personal work & learning spaces, schools, neighborhoods, universities, & industries) as potential hot spots of invention.	4a. Visitors reflect on ways that their work and learning spaces and their communities support /do not support invention.
5. Visitors see themselves as inventive.	5a. Visitors reflect on themselves as being inventive.

METHODOLOGY

RK&A employed two methodologies for the evaluation: timing and tracking observations and in-depth interviews with control and treatment groups.

TIMING AND TRACKING OBSERVATIONS

Timing and tracking observations provide an objective and quantitative account of how visitors experience *Places of Invention*, including which components visitors use, for how long, and how visitors behave. Timing and tracking observations document visitor behaviors in a standardized manner, which we can analyze statistically.

Observations are unobtrusive, so visitors were not asked to participate, but they were selected randomly upon entering the exhibition. To select visitors, the observer imagined a line just at the exhibition's entrance and selected the first visitor age 10 years and older to cross this imaginary line. Once the visitor crossed the line, the observer started a stopwatch and discreetly observed the movements of the selected visitor through the exhibition, recording the components used, time spent, and behaviors (see Appendix A for the timing and tracking form).

Observation data were analyzed using IBM SPSS Statistics Version 2.0, and analyses include:

- Frequency distributions (e.g., percent of visitors to stop at a component)
- Summary statistics (e.g., median time spent at a component)
- Inferential statistics[1] to examine the relationship among variables, including:
  - Cross-tabulations to show the joint frequency distribution of the variables, and the chi-square statistic (X^2) to test the significance of the relationship (e.g., "stop" [yes or no] was tested against "gender" to determine whether components were attractive to a particular gender).
  - The Kruskal-Wallis (K-W) test, which is a nonparametric test for differences in the medians of two or more groups[2] (e.g., "total time in the exhibition" was

[1] A 0.01 level of significance (p) was employed to preclude findings of little practical significance. When the level of significance is set to $p = 0.01$, any finding that exists at a probability (p-value) ≤ 0.01 is "significant." When a finding (such as a relationship between two variables) has a p-value of 0.01, there is a 99 percent probability that the finding exists; that is, in 99 out of 100 cases, the finding is correct. Conversely, there is a 1 percent probability that the finding would not exist; in other words, in 1 out of 100 cases, the finding appears by chance.

[2] The Kruskal-Wallis (K-W) test is a nonparametric statistical method for testing the equality of population medians of two or more groups. Nonparametric statistical methods do not assume that the underlying distribution of a variable is "normal" with a symmetric bell-shape, so they are appropriate for testing variables with asymmetric distributions such as "total time in the exhibition." The K-W test is analogous

compared by "gender" to determine whether time spent in the exhibition differed by gender).

INTERVIEWS

To complement the standardized and objective observation data, RK&A conducted in-depth interviews to understand the meanings visitors' make from the exhibition. The interviews are open-ended and encourage interviewees to express their opinions, understandings, and the meaning they construct using language and words that they naturally use to express themselves (as opposed to the language of the evaluator or researcher). Visitors age 10 years and older were eligible. Interviews were conducted with three different groups of visitors as part of a quasi-experimental research design. The three study groups are:

1. **Treatment A** - Visitors to *POI* who were interviewed immediately after visiting the exhibition
2. **Treatment B** - Visitors to *POI* who were recruited immediately after visiting the exhibition and interviewed by telephone two weeks later
3. **Control** - Visitors to NMAH who had not seen *POI*; they were mostly recruited in the corridor linking the central area of the Constitution Avenue entrance to 1 West

The control group is used as a baseline or control by which to measure the impact of *POI*. All interviews were audio-recorded and transcribed to facilitate analysis.

Interviews were analyzed qualitatively. That is, the evaluator read the interview transcripts and used codes to identify patterns and trends in the data. Additionally, for outcome measures, the evaluator developed a rubric to quantify achievement on a continuum. Rubric scores were then analyzed statistically, and analyses include:

- Frequency distributions (e.g., percent of visitors to stop at a component)
- Inferential statistics[3] to examine the relationship among variables, including:
  - Cross-tabulations to show the joint frequency distribution of the variables, and the chi-square statistic (X^2) to test the significance of the relationship (e.g., achievement on the rubric was tested against study group to determine whether *POI* impacted achievement).

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to a One-way Analysis of Variance, with the scores replaced by their ranks. The K-W test statistic *H* has approximately a chi-square distribution.

[3] A 0.01 level of significance (p) was employed to preclude findings of little practical significance.

TIMING AND TRACKING FINDINGS

RK&A conducted observations from July to August 2015. Observations are unobtrusive to provide a subjective account of how visitors experience the *POI* exhibition.

EXHIBITION CONTEXT

The majority of observations were conducted on weekend days (80 percent) and the remainder on weekdays (20 percent). The level of crowding was generally moderate (58 percent of observations), sometimes high (24 percent), and rarely low (18 percent).

During more than one-half of the observations (54 percent), components were broken and/or unavailable in the exhibition; during these observations there were no available wires at the Precision Manufacturing interactive or only previously used wires were available.

VISITOR BACKGROUND CHARACTERISTICS

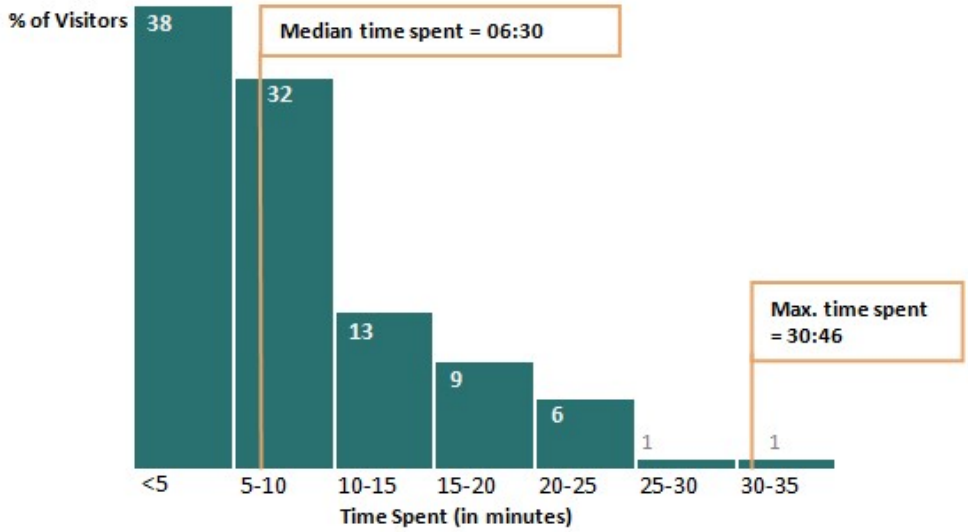
Observations were unobtrusive, but data collectors noted some general characteristics of observed visitors. Of the 100 visitors observed:

- The majority are adults (77 percent), and one-third of adults are between 45 and 54 years.
- Some are children between 10 and 17 years were observed (23 percent).
- One-half are male and almost one-half are female (51 percent versus 49 percent).
- Most visited in a social group (80 percent); about one-half were in adult-only groups and the other one-half in groups of adults and children.
- Several were alone (20 percent).

TIME SPENT

The *POI* exhibition is approximately 3,300 square feet. Observed visitors spent a short amount of time in the exhibition, spending between 32 seconds (0:32) and 30 minutes 46 seconds (30:46). As is typical, time spent does not follow a normal distribution. That is, many visitors spent a short amount of time in the exhibition (e.g., 38 percent of visitors spent less than 5 minutes in the exhibition), while a few visitors spent a long time (e.g., 8 percent spent more than 20 minutes). The median[4] time spent in the exhibition is 6 minutes 30 seconds (06:30).[5] Two variables—gender and group composition—affect time spent in the exhibition. Females are likely to spend more time in the exhibition than males (median time of 8:15 for females versus 05:04 for males). Visitors in groups (either adult-only or adults visiting with children) are also likely to spend more time than those who visit alone (median of 7:46 for visitors in adult-only groups and 7:19 for visitors with children versus 2:26 for visitors who are alone).

VISITORS SPENT A SHORT AMOUNT OF TIME ON AVERAGE IN *POI*



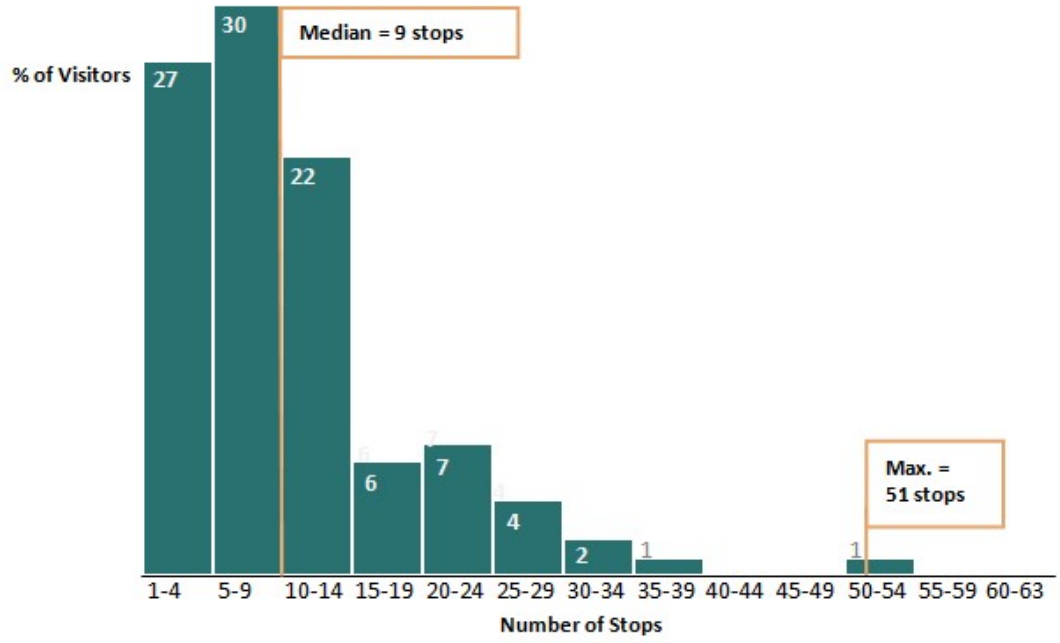
[4] Medians (versus means) are reported because, as is typical, the number of exhibits used and the time spent by visitors are distributed unevenly across the range. When the distribution of scores is extremely asymmetrical (i.e., "lopsided"), the mean is affected by the extreme scores and, consequently, falls further away from the distribution's central area. In such cases, the median is a better indicator of the distribution's central area because it is not sensitive to the values of scores above and below it.

[5] For comparison, the median time spent in NMAH's *Invention at Play* is 10 minutes 11 seconds (3227 sq. ft.). The median time spent in the National Museum of Natural History's *Q?rius* is 15 minutes 35 seconds.

TOTAL NUMBER OF STOPS

RK&A and NMAH identified 63 components in the exhibition (see the identified components on the timing and tracking form in Appendix A). Components were selected because they are distinct and observable sections, text panels, object cases, or interactives in the exhibition. Components vary in size; some are small (e.g., a singular text panel or small object case) and some are large (e.g., the Turntable and Precision Manufacturing interactives). Of the 63 components, observed visitors stopped at between one and 51 components. Like time spent, the number of stops does not follow a normal distribution, with many visitors stopping at only a few components (e.g., 30 percent of visitors stopped at five components or less). The median number of stops is nine. A few variables—gender, age, and group composition—affect the number of components visited. Females are likely to stop at more components than males (median of 10 stops for females versus 7 stops for males). And, adults are likely to stop at more components than children (median of 10 stops for adults versus 6 stops for children). Visitors in adult-only groups are also likely to stop more often than visitors with children or those visiting alone (median of 12 stops for visitors in adult-only groups, 7 stops for those who are alone, and 6 stops for those visiting with children).

THE MEDIAN NUMBER OF STOPS IN *POI* IS LOW



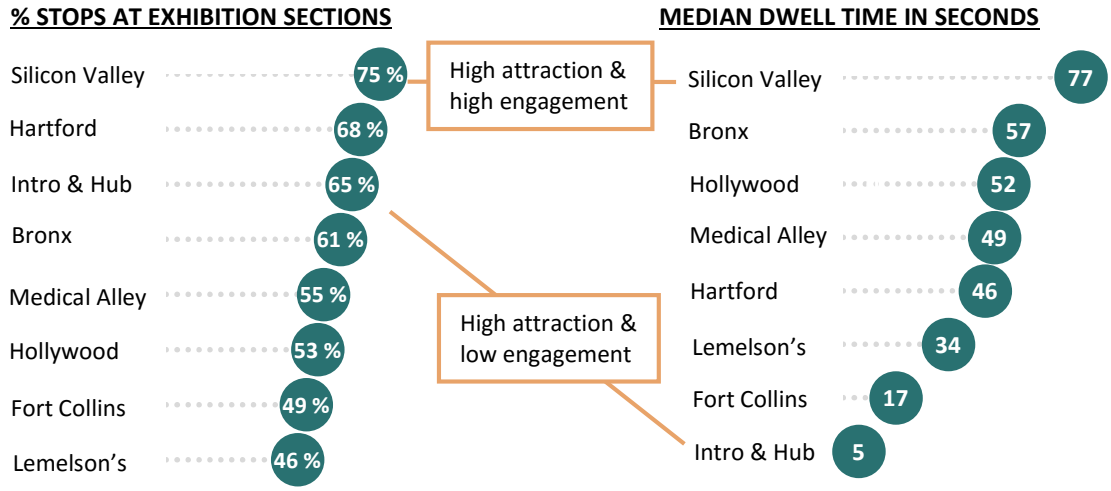
STOPS AND TIME SPENT BY SECTION

There are eight sections in the exhibition, and the median number of sections visited is five. The most visited sections are Silicon Valley (75 percent stopped), Hartford (68 percent stopped), and the Introduction & Hub section (65 percent stopped). There are a few variables that have a statistical relationship to section visitation:

- Females (versus males) are more likely to visit the Bronx.
- Visitors in groups, whether adult-only or adults and children (versus those visiting alone) are more likely to visit the Bronx.
- Visitors in adult-only groups (versus those visiting with children or those visiting alone) are more likely to visit Fort Collins and Hollywood.

The median dwell times for all *POI* sections except one are under one minute, indicating a moderate to low level of engagement in most sections. The exception is Silicon Valley, which is both the most-visited section (75 percent stopped) and has the highest median dwell time at 1 minute 17 seconds. A few sections—Hartford, Bronx, and Hollywood—fall somewhere in the middle, with between 58 and 68 percent stopping and median dwell times between 46 and 57 seconds. The Introduction & Hub section has the lowest level of engagement despite being one of the most-visited sections (68 percent of visitors stopped in this but the median time spent is 0:05). One variable has a statistical relationship to section visitation; children spent more time in Silicon Valley than adults (median dwell time of 2:56 for children versus 0:48 for adults).

SECTIONS HAD VARIOUS LEVELS OF ATTRACTION AND ENGAGEMENT



STOPS AND TIME SPENT AT SELECT COMPONENTS

VISITATION

The five most visited components are interactives or object cases. Not surprisingly, the majority of the most-visited components are located in the three most-visited sections:

- The Precision Manufacturing interactive in Hartford (53 percent of visitors stopped).
- Computers object case in Silicon Valley (49 percent).[6]
- Turntable interactive in the Bronx (48 percent).
- Technicolor Camera in Hollywood (45 percent).
- Icon Design interactive in Silicon Valley (43 percent).

Notably, nearly one-half of all components (30 out of 63) were ignored by 90 percent or more of all observed visitors. These include:

- All videos.
- Almost all Skill Spots (8 out of 9). The exception is the "Risk-taking" Skill Spot in the Medical Alley section, but note that only 11% of visitors stopped here.
- Almost all Connections Graphics (5 out of 6). The exception is the Connections Graphic in the Bronx section, but note that only 11% of visitors stopped here.
- The Hub Meeting Place (chairs area).

TIME SPENT

In terms of time spent, the five components with the highest dwell times are:

- Hub Kiosk (median time = 1:40, 14 percent stopped).
- Fort Collins Video (median time = 1:12, 2 percent stopped).
- Hub Meeting Place (median time = 1:04, 10 percent stopped).
- Behind the Magic of Technicolor interactive (median time = 0:41, 29 percent stopped).
- Icon Design interactive (median time = 0:37).

Note that only one of these components was also among the five most stopped at—the Icon Design interactive.

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[6] There is a statistical relationship between group composition and object case stops; visitors in adult-only groups are more likely to stop at this object case as well as the Bike, Sewing Machine & Colt, and the Prototypes (versus those visiting alone or in groups with children).

SOCIAL BEHAVIORS

During the observations, data collectors looked for two pre-determined social behaviors (pointing/beckoning and conversing/reading aloud) and several general behaviors (e.g., looking at or watching someone else use a component) across the exhibition.[7]

- **Converse/read aloud:** 66 percent of visitors were observed conversing with others (in their group or another group) and/or reading text aloud in the exhibition.[8] Not surprisingly, visitors in groups (either adult-only or adults with children) are more likely to converse/read aloud than those visiting alone. Females are also more likely to converse/read aloud than males. Age, however, did not affect this behavior—adults and children were observed conversing/reading aloud equally (i.e., adults did not converse/read aloud more than children).
- **Point/beckon:** 49 percent of visitors were observed pointing and/or beckoning to others in their group or another group in the exhibition. Again, visitors in groups (adult-only or adults with children) were more likely to do this than those visiting alone. Age and gender did not affect this behavior.

INTERACTIVES

There are six interactives in *Places of Invention*—the Hub Map/Kiosk in the Intro & Hub section, Icon Design in the Silicon Valley section, the Turntable in the Bronx section, the Workshop/Surgery Table in the Medical Alley section, the Precision Manufacturing interactive in the Hartford section, and the Behind the Magic of Technicolor interactive in the Hollywood section. The following pages present a detailed look at visitors' use of individual interactives. Note that inferential statistics could not be run given the small number of visitors who stopped at each.

[7] See Appendix B for the complete behavior data, including component-specific behaviors.
[8] Since the observations are unobtrusive, "read aloud" is a difficult behavior to capture as the data collector has to be in close proximity to the observed visitor. Therefore, we can assume it happened more often than is reported in this data collection method.

THE HUB

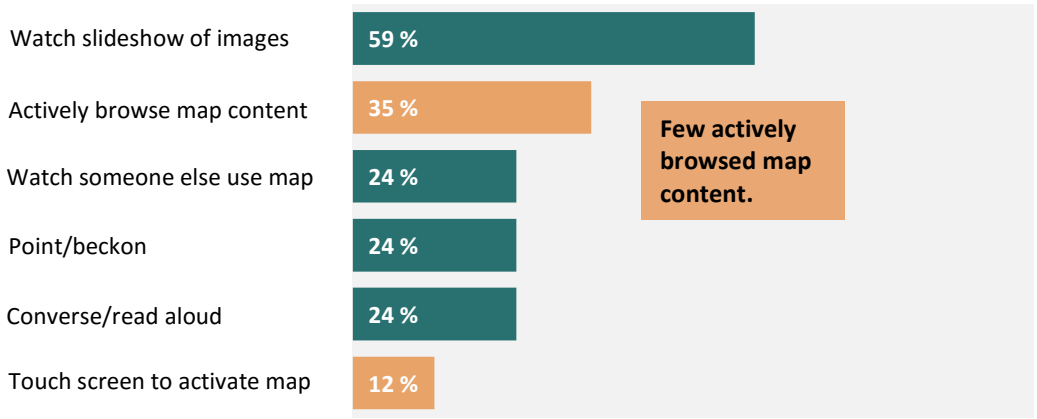
The Hub Map and Kiosk are both located in the Hub, in the center section of the exhibition. At the Hub Map, visitors can explore invention stories from around the world, while at the Hub Kiosk they can enter their own invention story to be displayed on the Hub Map. Visitors' use of these interactives was mixed: 73 percent did not stop at either component, 23 percent stopped at least one component (either the Map or the Kiosk), and 4 percent stopped at both components. While the two components are related, it is possible to use one with without stopping at the other (e.g., a visitor enters a story at the Kiosk but does not explore others' stories at the Map); thus, they are discussed separately below.

MAP

Of observed visitors, few stopped at the Hub Map (17 percent) and the dwell time is low (18 seconds). Active use at this component is moderate. For instance, 35 percent of those who stopped actively browsed the map content, and 12 percent of those who stopped touched the screen to activate the map, suggesting that visitors were more interested in watching others explore and/or that they did not realize that something would change if they touched the screens during the attract state (slideshow of images).

HUB MAP USAGE

Percents in graph based on 17 percent who stopped at the interactive

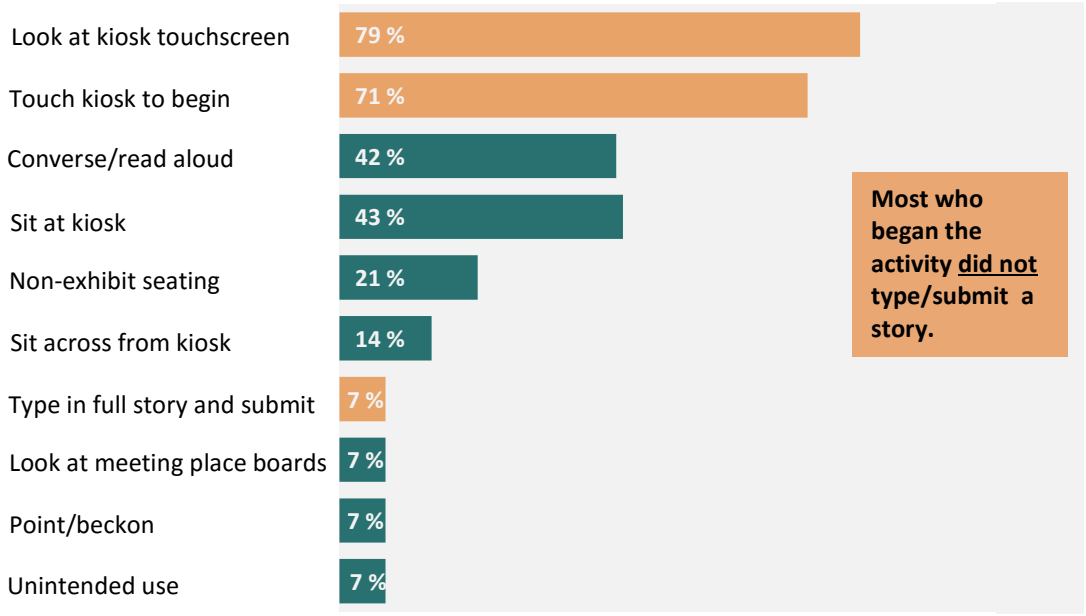


KIOSK

Few stopped at the Hub Kiosk (14 percent), but it has the highest median dwell at 1 minute 40 seconds. However, completion of the activity is notably low. That is, 79 percent looked at the kiosk touchscreen and 71 percent touched the kiosk to begin, but 7 percent of visitors who stopped (1 visitor) typed and submitted a full story, indicating that visitors lost interest, were confused, and/or became distracted by other components as they moved through the activity.

HUB KIOSK USAGE

Percents in graph based on 14 percent who stopped at the interactive



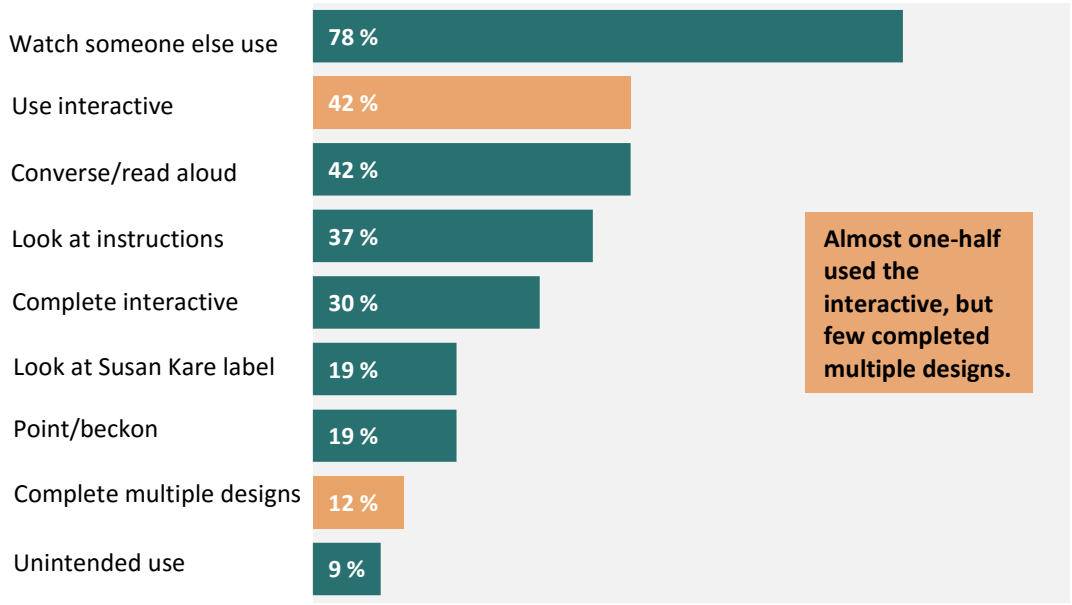
ICON DESIGN

The Icon Design interactive is located in the Silicon Valley section of the exhibition. At Icon Design, visitors can design their own computer icons by creating patterns out of a 32" x 32" black and white tile grid and pressing a button to "test" their designs on a computer screen.

Visitation to the interactive was high (43 percent stopped, making it the fifth-most-visited component in the exhibition) and the median time spent is moderate (37 seconds). Use was also relatively high, with 42 percent of those who stopped actively engaging in the interactive and 30 percent of those who stopped completing it. For most, it was a one-time activity (12 percent of those who stopped completed the activity multiple times).

ICON DESIGN INTERACTIVE USAGE

Percents in graph based on 43 percent who stopped at the interactive



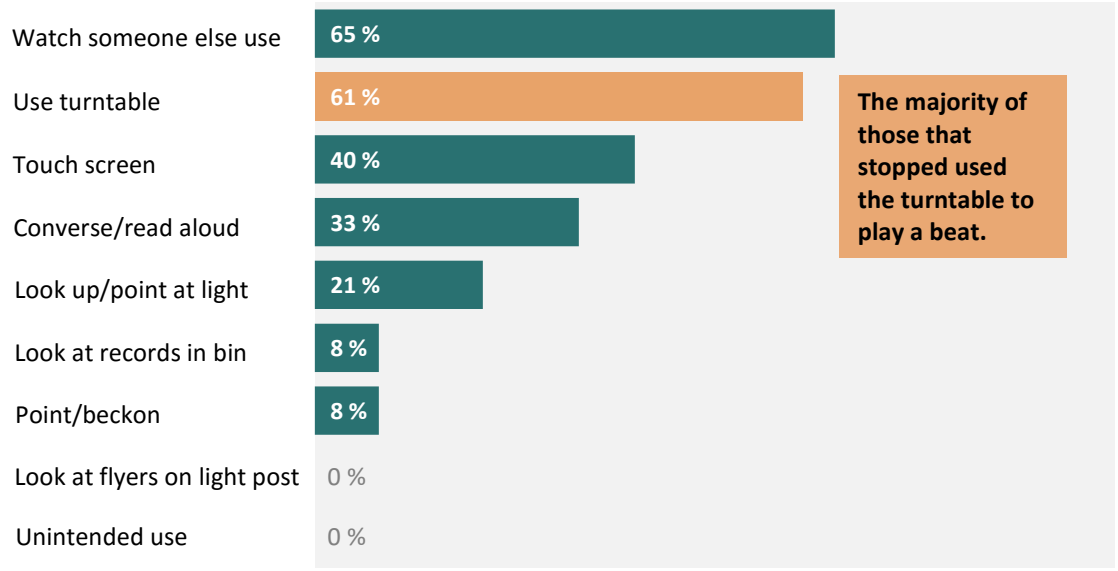
TURNTABLE

The Turntable interactive is located in the Bronx section of the exhibition. At the Turntable, visitors can watch video tutorials to learn how to "scratch" and play their own beats on turntables.

The Turntable had high visitation (48 percent stopped, making it the third-most-visited component in the exhibition), and the median dwell time was moderate (33 seconds). Use of the Turntable was high at 61 percent. And, several used one of the touchscreens (presumably to watch all or part of a video tutorial) (40 percent). Other components of the interactive were used less often—20 percent of those observed looked up and/or pointed at the flashing streetlight, 8 percent looked at the records in the bins next to the turntables, and none looked at the flyers on the streetlight post.

TURNTABLE INTERACTIVE USAGE

Percents in graph based on the 48 percent who stopped at the interactive



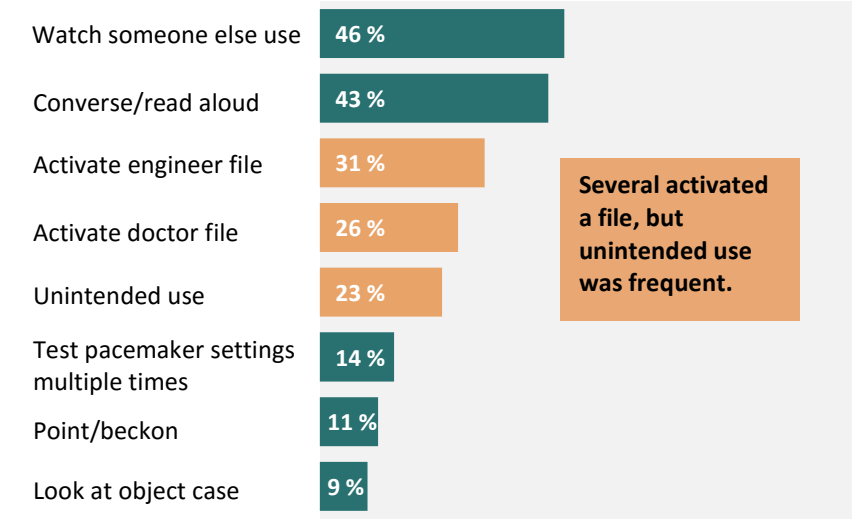
WORKSHOP/SURGERY TABLE

At the Workshop/Surgery Table interactive in the Medical Alley section of the exhibition, visitors assume the role of either doctor or engineer and modify the pacemaker settings to save a patient's life.

The interactive was moderately visited (35 percent), and the time spent was also moderate (30 seconds). Visitor use of the interactive was mixed. About one-half of those who stopped activated a file (40 percent activated either the doctor or engineer file, while 9 percent activated both), but a much smaller amount tested their pacemaker settings multiple times (14 percent). Passive and unintended use of the interactive was also high, with almost one-half of those who stopped watching someone else use the interactive at some point during their stop (46 percent), and almost one-quarter using the interactive in an unintended way, such as one person manipulating both sides of the exhibit (23 percent).

WORKSHOP/SURGERY TABLE INTERACTIVE

Percents in graph based on the 35 percent who stopped at the interactive



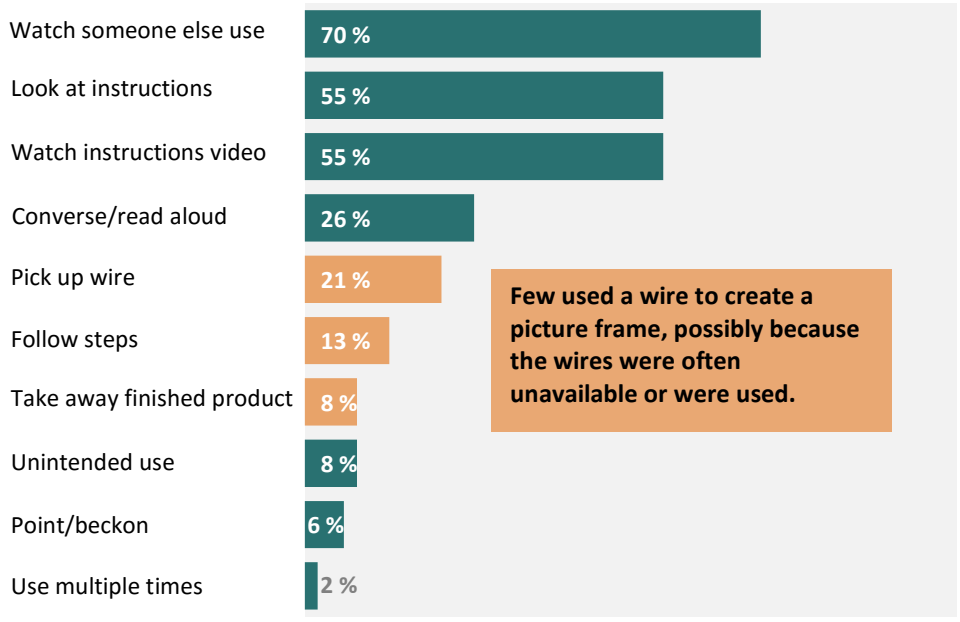
PRECISION MANUFACTURING

At the Precision Manufacturing interactive in the Hartford section, visitors can create a picture frame by manipulating a wire at four "jig" stations that include visual cues to instruct wire manipulation.

The interactive is the most-visited component in the exhibition (53 percent of those observed stopped), yet dwell time is relatively low at 23 seconds. Because of its popularity, the wires that are necessary for completing the interactive were not available when observed visitors stopped (for 26 percent of those who stopped), while other times only used wires were available (for 32 percent of those who stopped). Most of those observed did not use the interactive to create a picture frame.

PRECISION MANUFACTURING INTERACTIVE USAGE

Percents in graph based on the 53 percent who stopped at the interactive



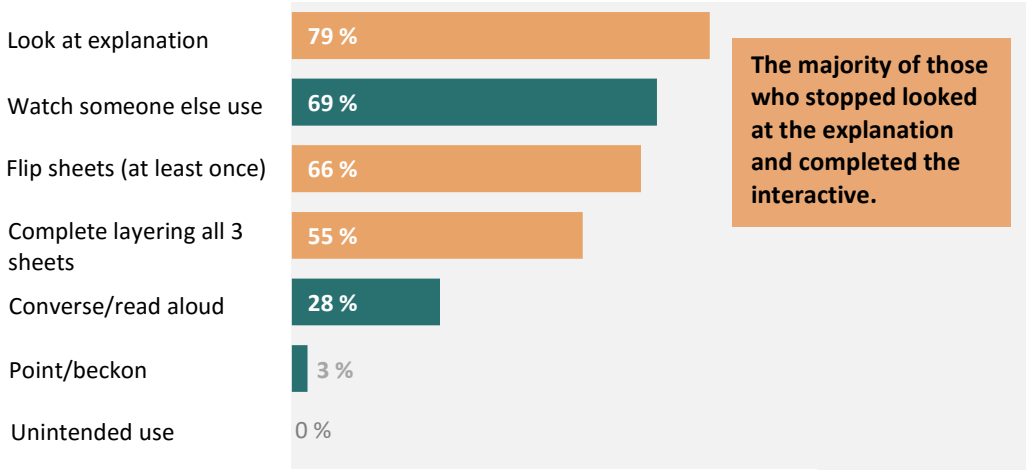
BEHIND THE MAGIC OF TECHNICOLOR

At the Behind the Magic of Technicolor interactive in the Hollywood section, visitors can learn how Technicolor film creates color images by flipping single-colored pieces of film together to create a full-color image (from a scene in the Wizard of Oz).

A moderate percentage of visitors stopped (29 percent), and the median dwell time is relatively high at 41 seconds—the fourth highest among exhibition components. Of those who stopped, use of the interactive was high; the majority of those who stopped looked at the explanation of how Technicolor film creates color images (79 percent), flipped one or more of the sheets (to begin creating the Technicolor image) (66 percent), and completed layering all three sheets to create the full Technicolor image (55 percent), suggesting the instructions are clear and the activity is simple and intriguing.

TECHNICOLOR INTERACTIVE USAGE

Percents in graph based on the 29 percent who stopped at the interactive



INTERVIEW FINDINGS

RK&A conducted 124 interviews with visitors to NMAH from July to September 2015. The interview design is quasi-experimental to measure outcomes, so interviewees constitute three groups as described below. All interviewees were asked the same questions, and Treatment A and B interviewees were asked additional questions specific to the exhibition.

Treatment A
Visitors to *POI* who were interviewed immediately after visiting the exhibition (*n* = 51, 42% response rate).

Treatment B
Visitors to *POI* who were recruited immediately after visiting the exhibition and interviewed by telephone two weeks later (*n* = 23, 11% response rate).

Control
Visitors to NMAH who had not seen *POI*; they were mostly recruited in the corridor linking the central area of the Constitution Avenue entrance to 1 West (*n* = 50, 53% response rate).

VISITOR BACKGROUND CHARACTERISTICS

Interviewees were recruited at NMAH using a continuous random sampling process of visitors 10 years and older. Of the 124 interviews, groups are largely:

- **Adults**—20 percent include children 10-17 years; there is a statistical difference between Treatment B group and the other two groups, with no children participating in Treatment B interviews, likely because that they were conducted on the telephone.
- **First-time visitors**—60 percent of groups include a first-time visitor to the NMAH.
- **US residents**—90 percent reside in the United States.

The 124 interviews included 168 interviewees:

- **Gender equal**—The gender split is approximately equal (52 percent male and 48 percent female).
- **Children are largely high-school age**—Of the 29 children who participated in interviews, 72 percent are 14-17 years while 28 percent are 10-13 years.
- **Adult age distribution is expansive**—Of the 139 adults who participated in interviews, ages range from 18 to 77 years, with the median being 46 years.

ENJOYABLE ASPECTS OF EXHIBITION

To provide context for the achievement of outcomes, interviewees who had visited the exhibition (Treatment A and B) were asked what they enjoyed most about the exhibition. Some interviewees named more than one aspect.[9] In order from most- to least-frequently mentioned, enjoyable aspects are:

- **Specific places**—44 percent of interviewees named a specific place that piqued their interest. Several of these interviewees named Silicon Valley (often because they remembered the computers on display), and several others named Medical Alley (often because of an interest in the medical field). A few each named Hollywood, Hartford, and the Bronx, while a couple of interviewees named Fort Collins. Treatment A interviewees (who had just visited the exhibition prior to the interview) were more likely than Treatment B interviewees to name a specific location.
- **Hands-on/interactive exhibits**—32 percent of interviewees enjoyed the hands-on and interactive exhibits. The majority of interviewees generally appreciated the hands-on opportunity (Treatment B interviewees were more likely to say they generally appreciated hands-on). But, of those interviewees who named specific interactive components, a few named the Hartford interactive; a couple each named the Bronx interactive and Silicon Valley interactive; while one named Hollywood's Technicolor interactive.
- **Concept of the exhibition—**21 percent of interviewees liked the exhibition's theme. One-half of these spoke specifically about the focus on place and the "ecosystem" that spurs invention in the area. A few other responses were more general, such as enjoyment in learning how inventions came about and seeing how inventions have changed over time (comparing what they saw in the exhibition to today's inventions).
- **Specific objects—**18 percent of interviewees named specific objects that they found interesting. One-half of these interviewees named the mouse and/or computers seen in Silicon Valley. Additionally, a few each were interested in Hollywood's Technicolor camera and the Bronx's turntables. A couple of interviewees mentioned the machinery in Hartford, and one mentioned the pacemakers in Medical Alley.
- **Design of the exhibition**—14 percent of interviewees liked the design of the exhibition. The majority liked that the exhibition was divided into "pods" for each location; these interviewees liked that it provided an in-depth look at diverse locations in a way that "wasn't overwhelming." Additionally, a few praised the exhibition's modern look.

[9] Percentages do not total 100 since interviewees may have named more than one aspect.

LEAST INTERESTING OR CONFUSING ASPECTS OF THE EXHIBITION

Interviewees who had visited the exhibition (Treatment Groups A and B) were also asked about what they found least interesting or confusing about the exhibition. In order from most- to least-frequently mentioned:

- **Nothing least interesting or confusing**—61 percent of interviewees did not find anything least interesting or confusing. Note that several of these interviewees are Treatment B interviewees whose memory of the exhibitions was poor.[10]
- **Specific place—**13 percent of interviewees named a specific place that was not interesting to them. Fort Collins was most frequently-named with interviewees saying it was "least clear," "didn't capture my attention," and explaining that they did not understand the connections between the inventions and the place. The Bronx was mentioned by a few interviewees, with one describing disinterest in hip-hop, one not understanding how it demonstrated invention as compared to the other places, and one hoping that the curator of this section had been African American. One disliked that Silicon Valley did not show all the companies that existed and faded over time.
- **Content delivery**—13 percent of interviewees made a comment related to how the content was delivered. For instance, the majority felt the exhibition was designed for children and so they, as adults, did not take as much away from the exhibition as they might have expected. A few others described how the content did not align with their expectations in other ways, such as not showing the evolution of invention or not going into greater depth about each of the individual locations.
- **Specific interactive exhibits**—7 percent of interviewees named a specific interactive where they experienced a challenges. A couple of interviewees said there was a lack of wires at the Hartford Precision Manufacturing interactive, while another couple of interviewees said the Bronx Turntable interactive lacked adequate direction and feedback. One interviewee said the Medical Alley exhibit was confusing because s/he had to collaborate to do the activity.
- **Navigation**—7 percent said they had challenges navigating the exhibition. A few interviewees said they were not sure where to start both in terms of the order of visiting the places and where to begin within an individual place. Another couple of interviewees said the crowding in the exhibition made it difficult for them to move around.

[10] Of Treatment B interviewees, 33 percent could not recall a place in the exhibition without prompting.

ACHIEVEMENT OF OUTCOMES

The five intended outcomes for the exhibition were measured on seven indicators related to the interview findings. See below for a summary of achievement by Treatment A and B interviewees on the indicators. Overall, Treatment A and B interviewees scored at the top of the continuum of achievement for most indicators. There is one statistical difference between Treatment A and B interviewees and Control interviewees, meaning this is the only area that the exhibition has measurable impact. Please see the in-depth analysis of achievement by indicator on the next several pages.

SUMMARY OF IMPACT

POI impact was measurable on one indicator (orange highlights)

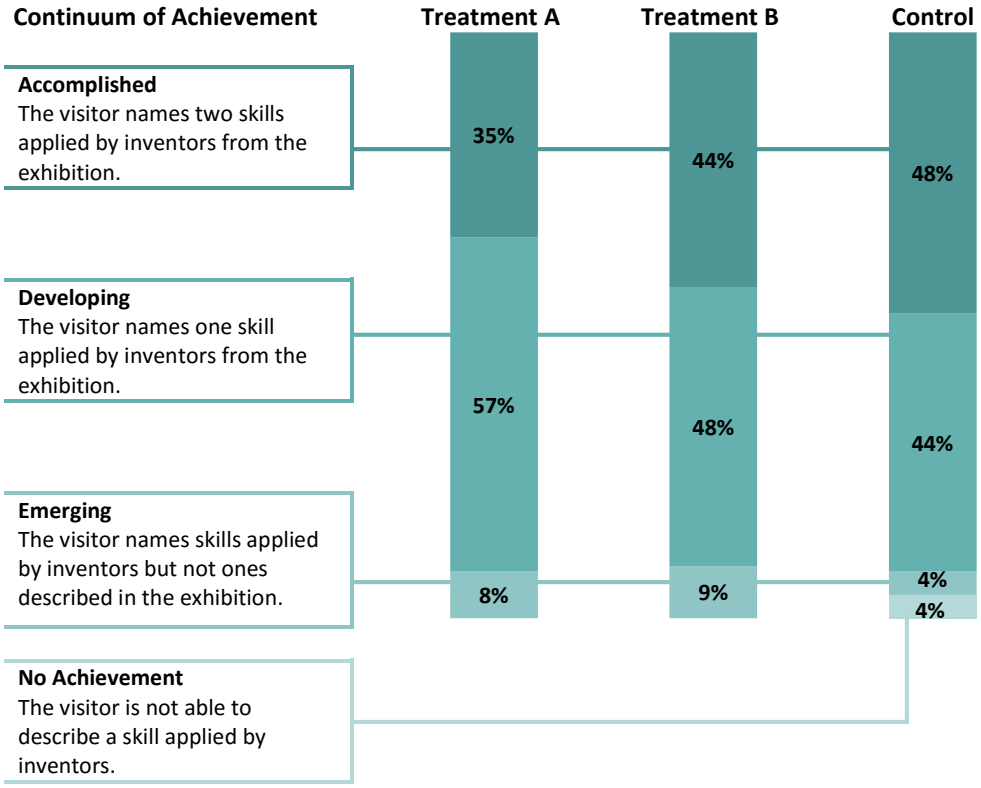
OUTCOMES	INDICATORS	ACHIEVEMENT (%at top half of rubric)
1. Visitors identify the 21st century skills that inventors practice.	c. Visitors name at least two skills applied by inventors using vocabulary from the exhibition.	92%
	d. Visitors associate at least one skill from the exhibition with at least one featured place.	74%
2. Visitors identify characteristics that support innovative communities.	**c. Visitors describe characteristics that support(ed) an inventive place.**	**74% *POI Impact**
	d. Visitors identify characteristics of featured places in the exhibition that supported invention.	61%
3. Visitors express interest in learning about inventions and/or inventors.	c. Visitors are interested in learning about inventions/inventors.	70%
	d. Visitors spent 4 minutes or more at one interactive or more.	11%
4. Visitors see places around them as potential hot spots of invention.	b. Visitors see places around them as potentially inventive.	56%
5. Visitors see themselves as inventive.	b. Visitors think of themselves as inventive	41%

INDICATOR 1A

Achievement of Indicator 1a is summarized below and described in depth on the following pages. Achievement is high overall, meaning that general awareness of the skills highlighted in the exhibition is high. There are no statistical differences in achievement between groups, meaning the exhibition did not affect visitors' awareness and understanding of these skills.

Outcome Visitors identify the 21st century skills that inventors practice.

Indicator Visitors name at least two skills applied by inventors using 21st Century Skills vocabulary as articulated in the exhibition (e.g. creativity, flexibility, adaptability, risk-taking, collaboration, communication, and problem-solving).



ACHIEVEMENT BY LEVEL

Achievement for Indicator 1a is defined by the number of skills interviewees were able to identify when asked to name three characteristics of inventors. To "identify" a skill, visitors were not required to identify the skill by the terminology used in the exhibition, but the visitor had to describe the skill in a way that aligns with the skill descriptions used in the exhibition. Given that there are multiple skills that could be identified, please see the section that follows organized by skill.

SKILLS

Interviewees did not have to use the exact terminology to receive credit for identifying a skill; rather, the evaluator studied the responses to determine the skills identified. Below are trends within all of the skills mentioned (listed in order from most- to least-frequently mentioned).

Creativity
Creativity was mentioned with similar frequency across the study groups (72 percent overall). Several said it is the most important skill since creativity generates innovation and the creation of something new. The term creativity was often used to describe this skill, but some interviewees also used the term "imagination" and "vision" along with it. For instance, one 72-year-old man said creativity is important to "imagine other ways to do things." "Think outside the box" was another term also used when talking about creativity.

Problem-solving
Problem-solving was mentioned with similar frequency across study groups (24 percent). Several of these interviewees described the importance of identifying a problem to solve or identifying a need for an invention. Several also talked about the problem-solving or critical thinking process, such as flipping a problem around, and another described root-cause problem solving. For example, one 47-year old woman said:

> Sometimes you look at problems, and we think of them the same way. . . And then someone comes along and says, 'Hey, let's think of this. Let's flip it around.' Usually that's where the breakthrough happens in terms of solving a problem.

Risk-taking
Risk-taking was mentioned with similar frequency across groups (17 percent). These interviewees described inventors as "taking chances" and "experimenting." Some of these interviewees named inventors that they considered risk-takers, such as Thomas Edison, Steve Jobs, and Elon Musk. A few described inventive personalities as having an "ego" and being audacious; for example, one 31-year-old female said:

> You have to be sort of bold, daring, and audacious to feel that you're the person who can realize an invention above and beyond actually having skill and the education and whatever else is involved—the ability to actually bring it about.

Communication
Overall, 11 percent described communication; note that it was not mentioned by any interviewees in Treatment A. The interviewees who identified communication often described it in terms of knowledge sharing, such as a couple of interviewees who described how invention "cannot happen in a vacuum" or "in isolation." Additionally, a couple of interviewees talked about the importance of being open to knowledge; for example, one 48-year-old woman said inventors have to have a "willingness to learn."

Collaboration
Collaboration was mentioned by 9 percent of interviewees overall. While statistical significance cannot be determined given how few described collaboration, it was described by a greater percent of Treatments A and B interviewees than Control interviewees. One 30-year-old man said of collaboration:

> I think connecting different pools of knowledge or expertise, and sort of being able to see those connections [is one characteristic of an inventor]. Having a sort of diverse and robust social network of people in different sort of areas. . . . You know other people, you can shop ideas around, and you can also get connected to a lot of other ideas through the network.

Adaptability
Adaptability was mentioned with similar frequency across groups (4 percent). While the statistical significance cannot be determined given how few described adaptability, it was described by a greater percent of groups with children than groups of adults only.

Other
There are two other responses that frequently arose:

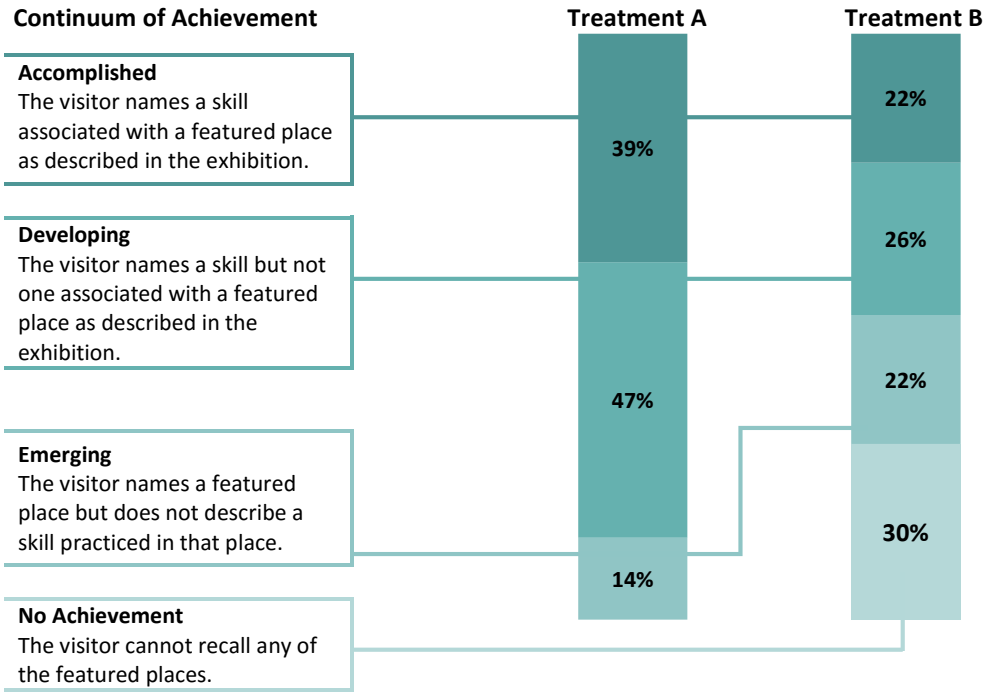
- **Determination/perseverance/patience** (52 percent)—This skill was mentioned many times with equal frequency across groups. These interviewees spoke about the many failures inventors face before making successful inventions, with some citing Edison and the Wright Brothers. Some of these responses broached the skills of risk-taking and problem-solving but did not speak to those skills as defined in the exhibition. Determination/perseverance/patience was more likely to be reported by repeat visitors to NMAH than first-time visitors.
- **"Special"** (20 percent)—While not a skill, several described inventors as having a "special," abnormal quality about them. For instance, a few referred to Steve Jobs as being quirky and "weird." A few linked this abnormality to what they perceived as the extreme intelligence required to be an inventor.

INDICATOR 1B

Achievement of Indicator 1b is summarized in the figure below and described in depth on the following page. Achievement for Treatment A is very high. There is a statistical difference in achievement between groups, with Treatment A (visitors who just saw the exhibition) scoring higher than Treatment B (those interviewed two weeks later).

Outcome Visitors identify the 21st century skills that inventors practice.

Indicator Visitors associate at least one skill from the exhibition with at least one place-story in the exhibition.



ACHIEVEMENT BY LEVEL

For this rubric, the evaluator examined the way in which visitors described skills in relation to how the skills were presented in the exhibition. For context, the skills presented are:

- Adaptability at the Bronx and Hartford
- Collaboration at Medical Alley and Silicon Valley
- Communication at the Bronx and Hartford
- Creativity at Hollywood
- Problem-solving at Fort Collins
- Risk-taking at Medical Alley

Accomplished – 33%[11]
These interviewees named a skill associated with a featured place as described in the exhibition. The majority of these interviewees described either Hollywood or Medical Alley. Interviewees who described Hollywood mentioned the creativity of the people there and the drive to make movies look better than they had, while interviewees that described Medical Alley talked equally about the collaboration between a doctor and mechanic (only one named the men) and the risks they were taking in attempting to invent the pacemaker. Silicon Valley was the next most mentioned (collaboration among hobbyists in the area).

Developing – 40%
These interviewees named a skill but not one associated with a featured place as described in the exhibition. The majority of these interviewees described the skill of determination/ perseverance/patience to one of the places of invention. Additionally, several described creativity in relationship to Silicon Valley, but some mentioned Steve Jobs or seemed to project their ideas on modern day Silicon Valley versus the time period depicted in the exhibition. A few others mentioned the importance of technical skills in relationship to Medical Alley and Silicon Valley.

Emerging – 17%
These interviewees named a featured place but did not describe a skill practiced in that place. Several of these interviewees mentioned Medical Alley and described the importance of the invention itself but were unable to describe the skills of the inventors that made the pacemaker possible. At least one interviewee mentioned each of the other locations.

No achievement – 10%
These interviewees, all Treatment B, could not recall any of the featured places.

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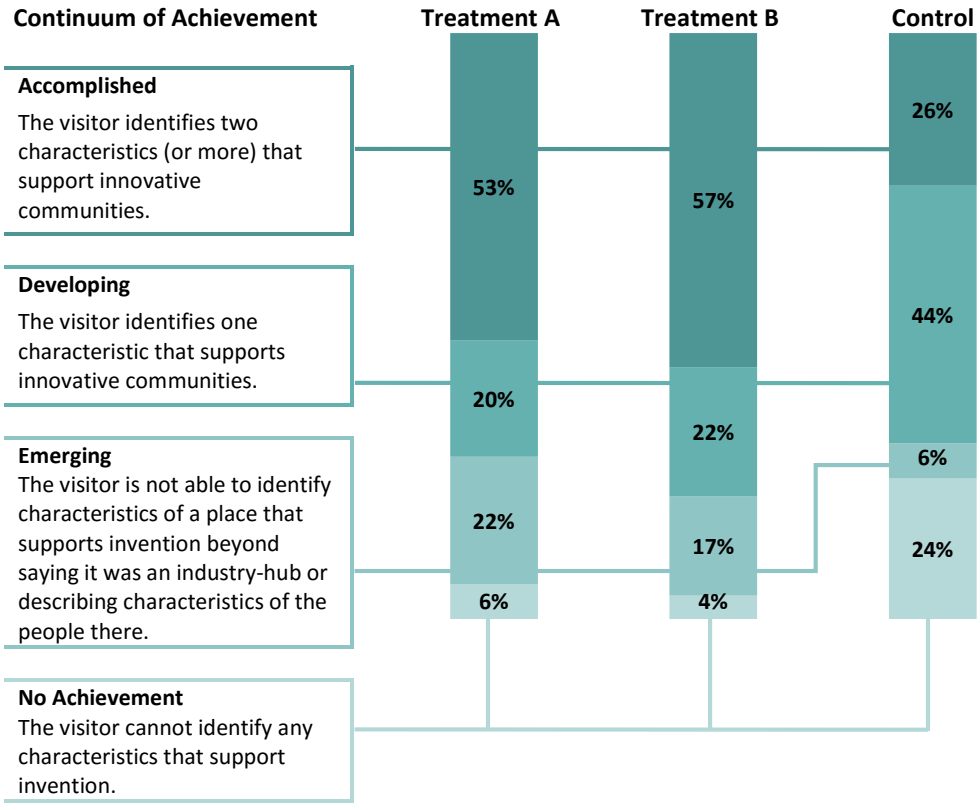
[11] Percents on achievement levels represent the total for all study groups because there are no statistical differences among groups.

INDICATOR 2A

Achievement of Indicator 2a is summarized below and described in depth on the following page. Achievement among Treatment A and B is very high. Also, there is a statistical difference in achievement among groups, meaning the exhibition had an effect on visitors' thinking about characteristics that support invention.

Outcome Visitors identify characteristics that support innovative communities.

Indicator Visitors describe characteristics that support(ed) an inventive place.



ACHIEVEMENT BY LEVEL

This indicator is the only one for which there was a statistically significant difference by study groups. The differences are most pronounced at the top and bottom levels of the continuum.

Accomplished – 43%
These interviewees identified two characteristics (or more) that support innovative communities. Many of these interviewees described a community that had identified a need or problem and how the community supported inventors, such as through natural or financial resources, universities, "soft infrastructure," and flexible work environments. For example, one 60-year-old man said:

> There's Menlo Park in New Jersey, Silicon Valley that's in California, and Stanford on the West Coast. And Austin, Texas is the new Silicon Valley. As far as the California location and Austin, Texas goes, they're both very big college areas, and I would imagine that they bring together "superior minds." And I guess that's what nurtures the inventors… They're progressive in their thought and socialization. They're liberal areas.

Developing – 30%
These interviewees identified one characteristic that supports innovative communities. Interviewees who named one characteristic identified a range of things, including some of the same characteristics as those scoring at the Accomplished level such as facing adversity and having a diverse population.

Emerging – 15%
These interviewees were not able to identify characteristics of a place that supports invention beyond saying it was an industry-hub or describing characteristics of the people there. Many of these interviewees described the "draw" or "attraction" of people to established places in an industry. Silicon Valley was most named followed by Hollywood, which explains why Treatments A and B interviewees were more likely to score at this level than Control interviewees. Also note that some of these interviewees were probed about why this place is a hub but were unable to identify why these places became a place of invention before they became established. A few described the characteristics of people who lived there, such as willingness to collaborate, without a characteristic of place (e.g., communal spaces).

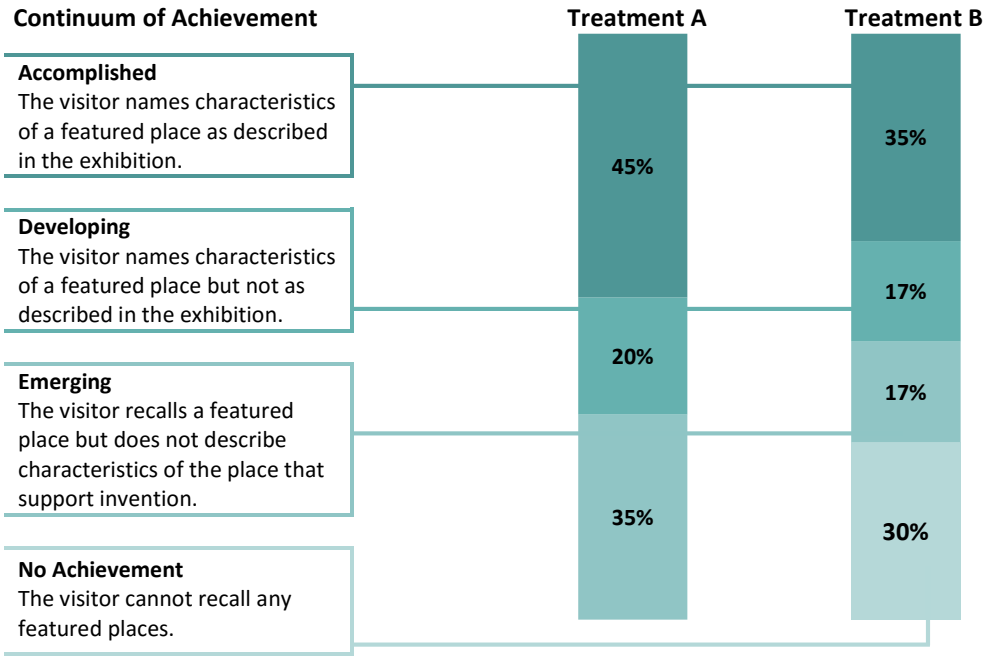
No achievement – 13%
These interviewees were not able to identify characteristics of a place that support invention. These interviewees were able to identify a place and the inventions or people who invented in that place, but were not able to identify characteristics of place.

INDICATOR 2B

Achievement of Indicator 2b is summarized in the figure below and described in depth on the following page. Achievement is high overall. There is a statistical difference in achievement between groups, with Treatment A (visitors who just saw the exhibition) scoring higher than Treatment B (those interviewed two weeks later).

Outcome Visitors identify characteristics that support innovative communities.

Indicator Visitors identify characteristics of featured places from the exhibition that support invention.



ACHIEVEMENT BY LEVEL

Accomplished – 42%
These interviewees named characteristics of a featured place as described in the exhibition. All places in the exhibition were mentioned except for Hartford. At this level, the most frequently named places are Hollywood (supported by climate and varied scenery) and Silicon Valley (supported by universities in the area and the electronics industry).

Developing – 19%
These interviewees named characteristics of a featured place but not as described in the exhibition. For instance, wealth and funding came up several times in support of inventors particularly in Silicon Valley, such as a 24-year-old man who said:

> Silicon Valley, I've noticed, has always been very kind of well-off. So they have the resources to kind of fund what they're looking for. You're not too terribly far away from LA and San Francisco, where you've got these major financial backers, and you've got the creative minds to come together.

Emerging – 29%
These interviewees recalled a featured place but were unable to describe characteristics of the place that supported invention. Interviewees who scored at this level identified all locations except the Bronx. However, Medical Alley was most cited; interviewees remembered the invention and that there was an important doctor and engineer there but could not recall beyond that what made Medical Alley a place of invention.

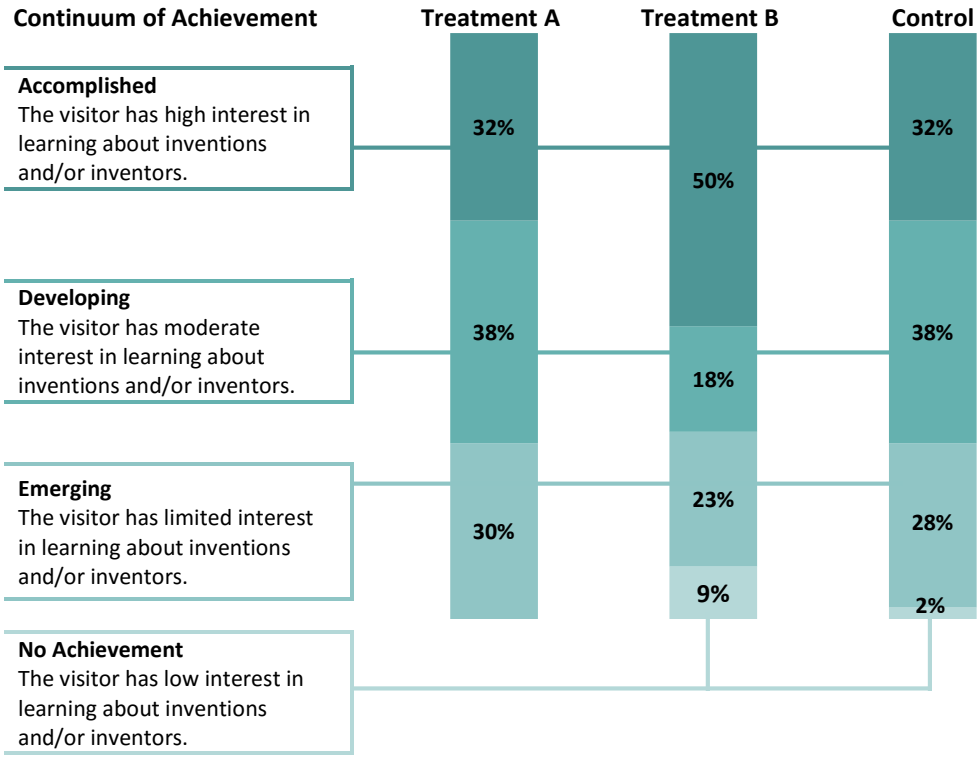
No achievement – 10%
These interviewees, all Treatment B, could not recall any of the featured places.

INDICATOR 3A

Achievement of Indicator 3a is summarized in the figure below and describes in depth on the following page. Achievement ranges from Emerging to Accomplished, meaning NMAH visitors' have varying levels of interest in invention. There are no statistical differences in achievement between groups, meaning the exhibition did not affect visitors' interest in invention.

Outcome Visitors express interest in learning about inventions and/or inventors.

Indicator Visitors express interest in invention (learning about inventions and/or inventors).



ACHIEVEMENT BY LEVEL

Achievement on this indicator is varied, as might be expected. However, note that few score at the level of No Achievement, likely because they are interested enough to be visiting a museum of American history (versus part of the non-visiting general public).

Accomplished – 35%
These interviewees described high interest in learning about inventions and/or inventors, including where the idea for an invention originates, the various iterations it went through before development, how the invention is made, and how it affects everyday life today. A few of these interviewees self-identified as working with invention, such as engineers, manufacturers, and patent lawyers.

Developing – 34%
These interviewees described moderate interest in learning about inventions and/or inventors. Several of these interviewees had a particular interest in how inventors came up with the ideas for an invention. As with interviewees at the Accomplished level, some also expressed interest in how inventions are made and the effects on everyday life, but their interest was more subdued.

Emerging – 28%
These interviewees described a limited interest in learning about inventions and/or inventors. Interviewees often had an interest in specific types of invention but nothing beyond that; they were not interested in learning how things are made or the evolution of ideas.

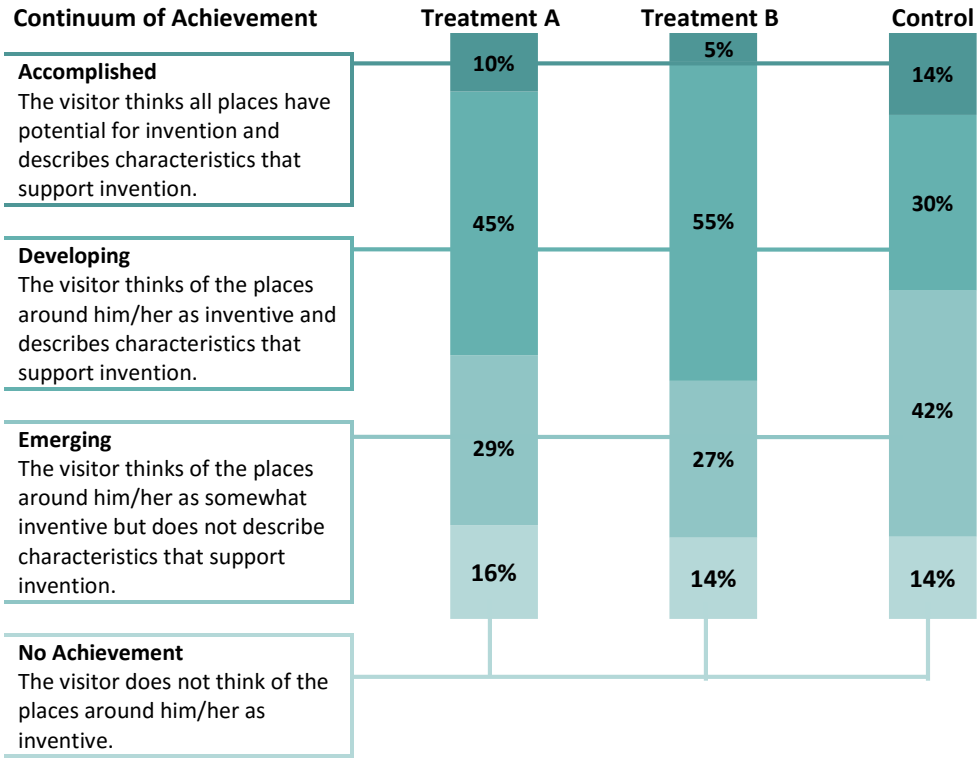
No achievement – 3%
These interviewees described low interest in learning about inventions and/or inventors.

INDICATOR 4A

Achievement of Indicator 4a is summarized in the figure below and described in depth on the following page. Achievement is mostly Emerging to Developing, meaning NMAH visitors' have room to grow on this indicator. There are no statistical differences in achievement between groups, meaning the exhibition did not affect visitors' interest in invention.

Outcome Visitors see places around them, such as their own work and learning spaces, municipalities, schools, universities, neighborhoods, and industries, as potential hot spots of invention.

Indicator Visitors reflect on ways that their work and learning spaces and their communities support /do not support invention.



ACHIEVEMENT BY LEVEL

Accomplished – 11%
These interviewees think all places have potential for invention and describe characteristics that support invention. A few of these interviewees said the necessity of a place is particularly true in modern society when people are more connected around the world than ever, but a few also said that a place of invention could be anywhere were support is provided. For example, one interviewee said:

> Someone could be born right now that's going to cure cancer. And that could be anywhere. They could go to college anywhere. So you never know where ideas spark from. So I think support is, and positive reinforcement, is the most important thing [for supporting invention].

Developing – 41%
These interviewees think of the places around them as inventive and describe characteristics that support invention. These interviewees often named major cities that they live in or the urban center of their metropolitan area. For example, one 71-year-old man said:

> We live in Maryland. There's a really substantial medical community surrounding the National Institutes of Health, so I think a lot of medical advancement has happened there. And if you look at the Washington area, AOL and other sorts of electronic communications, and frankly, the DARPA, the defense advanced research folks, do an immense amount. The federal government funds a lot of defense stuff and the medical stuff. . . Washington and the federal government probably doesn't get the credit for sponsoring so much innovation. And there are a lot of universities here too, as far as that goes.

Emerging – 34%
These interviewees think of the places around them as somewhat inventive but do not describe characteristics that support invention. These interviewees tended to be from rural areas. For example, one 25-year-old woman from Michigan said:

> There's a pretty cool brewery where we're from. I don't know if that counts. Where we're from is kind of small, so I don't know if there are necessarily a lot of things happening. I'm trying to think like kind of outside of our area. Yeah, I can't really think of anything really.

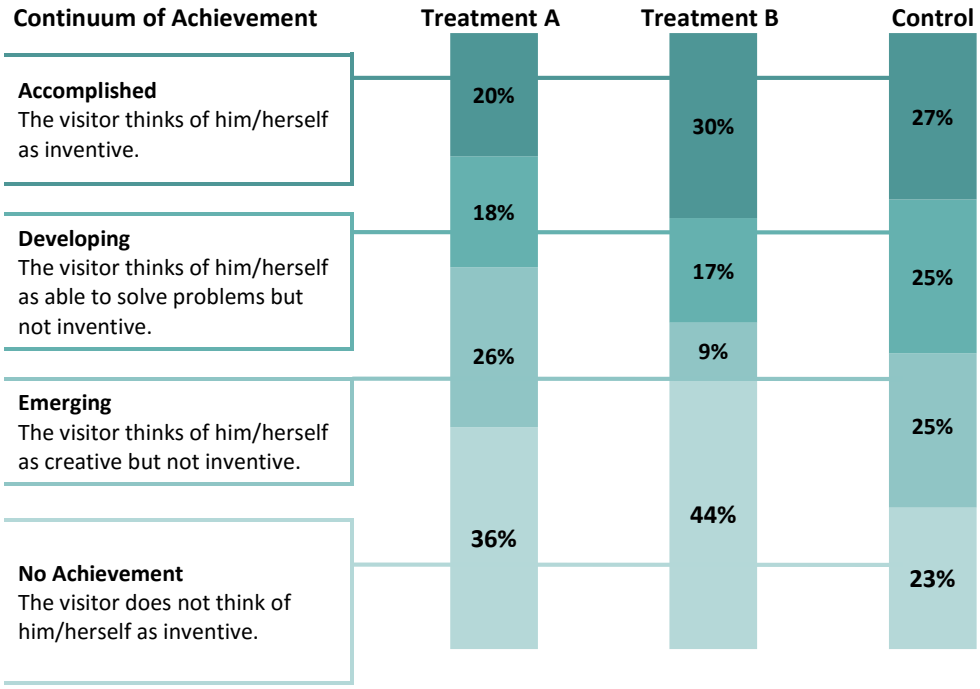
No achievement – 15%
These interviewees do not think of the places around them as inventive.

INDICATOR 5A

Achievement of Indicator 5a is summarized in the figure below and described in depth on the following page. Achievement is largely at the bottom of the continuum, meaning visitors' attitudes vary greatly. There are no statistical differences in achievement among groups, meaning the exhibition did not affect visitors' attitudes about being inventive.

Outcome Visitors see themselves as inventive.

Indicator Visitors reflect on themselves as being inventive.



ACHIEVEMENT BY LEVEL

Interviewees were asked if they thought if they thought about themselves as an inventive. Note that in many responses, interviewees laughed in response to the question, suggesting a level of discomfort in describing their personal perception.

Accomplished – 25%
These interviewees think they are inventive. They are confident in their abilities to problem-solve and consider themselves creative. Some are self-identified tinkerers, while others consider themselves as applying creative and critical thinking to their daily life. Even at this highest level of confidence in their abilities, these interviewees were reluctant to label themselves as inventive; for example, one

> Yes, [I think of myself as inventive]. I make things—maybe invent is not the right word. Create is probably better—but just, hobbyist electronics, and I do a little bit of app work, mostly on the side, and then I have a job, too. [Laughter]

Developing – 21%
These interviewees think of themselves as problem solvers but not inventive. They often describe themselves as being able to improve processes, and find fixes to household issues. A few also consider themselves as idea-people, but then need a partner to take the idea to fruition; for example, one 38-year-old man said:

> I just come up with an idea and make something work or fix something with something else. I come up with ideas, and I see them down the road for someone else to make. [Laughs]

Emerging – 22%
These interviewees think of themselves as creative but not inventive. They describe themselves as having an artistic side but don't think they have the know-how to invent something technical. For example, one 25-year-old woman said:

> Probably not [inventive]. Not inventive, just creative. I'm a musician so I have creative ideas like that. As far as inventing, no I'm not the kind of person.

No achievement – 32%
The interviewees do not think of themselves as inventive. These interviewees often described lacking the determination and patience (see quotation below from 64-year-old woman and 65-year-old man), but a few also named limitations such as technical knowledge and time.

> No [we are not inventive]. *Because if we get frustrated, we just go and hire somebody else to do it. [Laughter] *We just quit. [Laughter] Well, I wouldn't say I quit. *We hire somebody else to figure it out.