Making the Future: Promising Evidence of Influence
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Background
Over the past several years, many individuals, programs, and organizations have embraced the idea that “making” can spark and foster science, technology, engineering, and mathematics (STEM) engagement and learning. Several of today’s STEM innovators point to their own experience in making as part of their development of STEM appreciation; however, there is very little systematically collected and analyzed data regarding the role that making programs play in shaping interest, engagement, and knowledge in STEM. That said, synthesis of the wisdom of practice along with many case studies of young makers has helped maker education quickly evolve into a movement. Cognizant Technology Solutions (Cognizant) has played an important catalytic role in the evolution of this movement through their investment in maker education with a focus on STEM learning. Cognizant’s investment has focused on increasing the number of maker programs across the United States and on capacity building within the maker movement by articulating STEM related outcomes and evaluating the influence of their investment.

In 2013, Cognizant invested in 25 maker programs across the United States as part of their Making the Future (MTF) initiative. This investment was one of Cognizant’s educational initiatives designed to: “promote learning opportunities that are widely accessible, stimulating, enriching—and fun” and “ensure a skilled, knowledge-based workforce that can continue to meet today’s and tomorrow’s challenges.” In Summer 2013, The Research Group at the University of California, Berkeley’s Lawrence Hall of Science partnered with Cognizant to document the rationale and influence of their Making the Future (MTF) initiative. These efforts resulted in a logic model for MTF, a proposed strategy for establishing key benchmarks & targets for the initiative, and some promising evidence of the influence of their investment in maker programs across the United States.

Why Invest in Making?
The figure below summarizes the logic model that underlies the Making the Future (MTF) initiative. Starting from the left, there are key assumptions that underlie the MTF initiative. These assumptions undergird the design and implementation of MTF. The next column summarizes the two key strategies through which MTF seeks to make change. These strategies are expected to result in outputs, which, in turn, lead to outcomes for participating youth and the organizations involved in maker education. Finally, if implemented successfully at scale,
MTF could have an impact well beyond Cognizant’s specific investments by influencing the quality of the workforce, the prevalence of making in U.S culture, and the understanding of the link between maker education and STEM learning. This logic model is intended to provide a roadmap for future investment and evaluation.

![Figure 2: Logic model for Cognizant’s Making the Future (MTF) initiative](image)

**Promising Evidence of Influence**

Our MTF Evaluation efforts during 2013 were developmental in nature, focusing on assessing and informing program delivery, improvement and strategy, and capturing selected data purposefully to provide rapid, usable feedback. Accordingly, our work focused on determining meaningful outcomes for maker programs in general, and MTF more specifically.

**Scope and Scale.** In 2013, Cognizant invested in 25 maker programs in 15 states across the U.S. Participants in these programs ranged from young children (Pre-K) through emerging adults (age 25) with most of the participants within the range of age 8 to 18. From the outset, this group of grantee programs indicated that they would serve approximately 2,500 participants through a wide range of making programs—residential camp, day camp, afterschool, weekend, drop-in, etc. MTF participating locations were spread across the country with a high concentration of programs in the Northeast/Mid-Atlantic and Great Lakes regions of the United States. The distribution of programs is displayed in the map that follows.
Participant Outcomes. Participant survey data suggests that programs that receive funding from Cognizant are contributing to the development of the youth outcomes specified within the logic model. More specifically, the youth participating in Cognizant-funded maker programs are increasing their activation towards STEM over the course of their participation in these programs. STEM learning activation (www.activationlab.org) refers to the combinations of dispositions, skills, and knowledge that position an individual for current and future success in STEM learning. These combinations include:

- **Fascination.** Emotional and cognitive attachment (curiosity, positive affect, obsession) with natural and physical phenomena as well as STEM topics and tasks.
- **Value.** The value one places on STEM & innovation, including the knowledge learned in STEM, the ways of reasoning used in STEM, and the role that STEM plays in communities.
- **Competency Belief.** The extent to which one believes s/he is competent in STEM.
- **Perceived Autonomy.** The extent to which one believes that s/he has the agency to pursue his/her own STEM interests and choose his/her role in inquiry and innovation.
- **Innovation Stance.** Enthusiasm for new ideas and for trying new ways of doing things.
- **Problem Solving.** The process that one uses when confronted with unfamiliar tasks.
- **Creative Thinking.** The extent to which one generates new ideas within or across domains of knowledge (new configurations or ideas, new possibilities for something that already exists, discovering/imagining something entirely new).

During 2013, a subset of participants from 10 programs took pre- and post- survey assessments related to the first five of these dimensions of STEM learning activation. Analyses of these data indicate that, overall, participants demonstrate a modest, yet statistically significant, increase in
their levels of fascination, value, competency belief, perceived autonomy, and innovation stance from pre-survey to post-survey. Due to the limitations of this study (time for participants to take assessments, scope, and timeline) we were not able to assess the last two dimensions (problem solving and creative thinking) during 2013.

Emerging Themes
Themes worthy of future consideration emerged from analysis and synthesis of data. The following two are included among them:

• Cognizant’s strategy of making one-time investments to help launch new programs (or new aspects of programs) provided critical (and often catalyzing) support for maker programs. It is important to note that these investments had different roles depending on the organizational context in which they landed. The few individuals we spoke with who were involved in new or start-up organizations indicated that one year is not long enough for a new program to figure out the business model and investors needed to keep the program alive after Cognizant’s investment comes to an end. On the other hand, when investments land in an established organization with existing capacity for program development and funding, a year may be sufficient. Accordingly, it might be worth considering two-year investments in new programs that are catalyzed by these grants within new organizations.

• Several interviewees and site leaders at the locations we observed articulated the need for more support infrastructure for maker programs. More specifically, they were interested in a place where they could easily locate project ideas, sources for materials, support and training for maker educators, measurement and evaluation tools, and expertise related to particular tools and equipment.

Implications for Future Work
Cognizant’s MTF initiative has played an important role in building capacity for making across the U.S. and has influenced the dispositions, skills, and knowledge of youth who participated in programs funded by Cognizant. While the study described herein offers evidence of promise of the strategies they have invested in, additional data is needed to understand if the results shared in this report are (1) generalizable across the population of youth who participate in a Cognizant-funded maker program and (2) able to be causally-linked to youth participation in these programs.

Figure 4: Youth making shirts in Cognizant-funded maker program