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Rapid Experimentation: The Silicon Valley Method of Success

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Abstract

The methodology of rapid experimentation focuses on discovering a problem's solutions through leap-of-faith assumptions that will delight the end users. Rapid experimentation has been used by Silicon Valley in developing products and services that have excited consumers and changed business expectations. Developers need to have high functioning team members that are open to new experiences and that can deliver experiences to customers from products and services that not only exceed customer expectations, but delight them. In this paper, we present a case using this Silicon Valley methodology of rapid experimentation in solving the problem of substance abuse. We reflect on two team's efforts in finding a solution to the problem of substance abuse. Starting at the same time, using the same resources, and having access to the same information, each team found a different solution. Both solutions are valid as both exceeded and delighted the users. Furthermore, this case illustrates that the application of rapid experimentation can be injected into classrooms to develop critical thinking and problem-solving skills.

Learning Outcomes

By the end of this case, students should be able to

- Explain why rapid experimentation is an effective methodology for innovating solutions to complex applied research questions such as substance abuse
 - List the three steps in the rapid experimentation process
 - Apply the three steps in the rapid experimentation process to a significant research question relevant to the student
 - Design a rapid experiment to solve complex applied research questions relevant to the student
 - Identify potential obstacles the student may encounter during the rapid experimentation process and offer adjustments
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Project Overview and Context

In 2017, the authors, faculty, and students from a public university in the Appalachian region collaborated on a joint project with sponsors from a leading Silicon Valley technology firm focused on innovating answers to a complex applied research question—identifying viable solutions to address *substance abuse* (e.g., alcohol and drugs) in West Virginia. The purpose of this project was to develop potential solutions addressing specific issues through connecting researchers with individuals attached to the challenge issues by utilizing the innovative research, design, and presentation process of rapid experimentation.

Substance abuse has some impact on every citizen and visitor in West Virginia. As a result, public and private resources have been allocated to combat this crisis. Consequently, the effectiveness of combating this

epidemic is questionable. This begs the question, “*What is the best program to combat and resolve the issues of substance abuse?*” In solving this question, resources can be more wisely directed to the underlying issues surrounding the question. Moreover, taking the right course of action will improve society through improving the lives of those affected, reducing criminal activities associated with substance abuse, and increasing the participation in the workforce. In essence, practical research that has a great cause (i.e., solving substance abuse) with a potential to significantly impact society.

Traditionally, the West Virginia economy was based on extraction (e.g., coal, gas, timber, and salt) and manufacturing (e.g., chemical and steel) industries. The overall economies have changed, poverty has increased, and substance abuse (especially opioids) has significantly grown. As a result, new business ventures that can supply much needed jobs and tax revenues may avoid West Virginia. From a public policy standpoint, mitigating substance abuse use is a critical pillar in resolving the economic problems facing West Virginia. Therefore, any positive impact in mitigating substance abuse can be significant. This is why we wanted to make a contribution to research—in hopes that *our* solutions could make a difference. In hopes of identifying solutions that will combat the substance abuse, the sponsors provided resources, the foundation for rapid experimentation, and an environment for conducting research.

Unlike typical academic research methods, rapid experimentation is a particularly effective applied research method due to its utilization of robust authentic data to drive creative processing in developing solutions to issues (Rice, O’Connor, & Pierantozzi, 2008). Solutions can be simple improvements to complex modifications or new concepts of addressing the issue (Wrigley & Straker, 2016). Rapid experimentation is used widely across leading tech firms in Silicon Valley, where success is driven by pursuing the right course of actions while minimizing the use of resources in pursuit of failed concepts. Hence, rapid experimentation’s exceptional strength lies in its ability to identify failures quickly while using very limited resources. This is why rapid experimentation is so important to resource starved entities such as the State of West Virginia, new ventures, and organizations seeking a competitive advantage.

The competitive advantage of rapid experimentation is in the iterative approach in solving the issue. The quick sequential interactions involving participants in finding the solution truly leads an innovative process that embraces creativity. Participants who are passionate about the issue will guide researchers in discovering alternative solutions. Moreover, it is imperative that researchers do not place constraints (e.g., financial) in finding the solution as these will only serve to stifle creativity and innovation. Through repetition, researchers are quick in identifying failures which facilitate discovery of a robust solution. The faster failures are identified, the more rapidly a solution will follow.

Although this case relies on gathering information in the field from participants, it can be adapted for classroom use. In the next section, we present the platform and design for the research undertaken.

Research Design

To produce solutions for West Virginia's substance abuse challenge, this research followed a rapid experimentation methodology. Rapid experimentation is conducted via an iterative, recursive, and lean feedback loop (Acemoglu, Bimpikis, & Ozdaglar, 2011). First, a set of "leap of faith" assumptions are identified. "Leap of faith" assumptions are critical aspects of the prototype that the researcher believes are most valuable to the customer. Metrics are then selected and hypotheses developed which enable researchers to directly test the "leap of faith" assumptions. Next, a low-fidelity prototype is quickly and cheaply produced. Prototypes can be made in a variety of methods (e.g., sketches, basic arts and crafts supplies, digital tools, etc.) (Wrigley & Straker, 2016). This prototype is then run with target customers while behavioral data are collected. While running the experiment, researchers have duties to perform. Researchers should set the scene for the customer, greet the customer, direct the customer, puppeteer the prototype (if necessary), and record the customers' behavioral data. Resulting metrics from the experiment are then compared with the hypotheses to determine which of the "leap of faith" assumptions have been validated or invalidated. Invalidated ideas are refined, improved, and enhanced giving birth to new ideas and a successive iteration of the prototype. This process is repeated in rapid succession, with each iteration inching closer and closer toward the satisfaction of customers. Ultimately, the final iteration exceeds the expectations of customers who are exceptionally excited and delighted with the solution.

Rapid experimentation is utilized to quickly and cheaply test an idea from the customers' (or participants') point of view (Rice et al., 2008; Thomke, 2001). To get this depth of understanding, researchers go into the *field* to collect authentic information (i.e., data) from customer interactions with the prototype. Furthermore, as these types of prototypes are quickly and cheaply produced, the researcher (i.e., the firm) has more latitude to be bold and think "big." Another by-product of rapid experimentation is that customers can "show" researchers solutions rather than simply "telling" them their solutions or explaining what they would do. This characteristic highlights an important note—rapid experimentation discourages the use of surveys and similarly restricted data collection processes as these "closed" processes can influence and bias participant responses (Wrigley & Straker, 2016). The reference to closed processes indicates a method of questioning participants in which information collected is constrained to those pre-established questions; that is, additional information beyond the questions are not collected. By contrast, open-ended and free flowing questioning methods are embraced by rapid experimentation. In fact, data have to be collected from the source, it cannot be substituted.

This "lean" process notes that time is a resource, imperfect information exists, and important information can be obtained with small numbers if the methodology is followed accordingly (Wrigley & Straker, 2016). The goal of rapid experimentation is a paradox. In searching for solutions to any problem, the best answers are usually sought. In rapid experimentation, solutions to the problems emerge through failures: The identification of negative issues, gaps, and outcomes do not excite the participant. Thus, failures are considered accomplishments. As any solution associated with a failure is also a failure, further resources directed toward the pursuit of those "failed" solutions can be terminated.

For the research project, two teams, *Hi Mountains* and *Rapid Response*, were formed to develop solutions for the substance abuse challenge. Prior to interviews, each team generated ideas and concepts in a

brainstorming session that formed the overarching conceptual solutions concerning substance abuse. To illustrate the differences between the groups, each group's interview solutions is subsequently presented in the "Method in Action" section.

Research Practicalities

In preparation for the research project, researchers (i.e., two faculty and six students) were assigned to teams based upon the researchers' applications. Decisions concerning team assignments were based upon a researcher's academic discipline, college affiliation, and expressed area of interest (i.e., problem to be solved). This allowed teams to be constructed with a greater diversity of skillsets while also ensuring that each team had a fair opportunity to engage within this competition. Some significant barriers facing teams were the lack of shared experiences' need for a team to be highly effective, the limited experience conducting research with actual participants, and the unfamiliarity with the research methodology (i.e., design thinking and rapid experimentation).

To assist teams with understanding rapid experimentation, a facilitator from the sponsoring company was assigned to each team in a 2-day "training program." Developing high performing teams, especially with diverse members, takes time and requires shared experiences among members to understand their expected contributions. Understanding this environment, the facilitator's central role was to expeditiously improve team performance, provide a deep understanding of methodologies, and develop self-managed teams. [Table 1](#) generally identifies a team facilitator's critical role tasks, common positive actions associated with completed the task, and the expected results of those actions.

Table 1. Role tasks critical to effective team building.

Role task	Action	Result
Maintain team focus	Reiterate team mission and objectives	Reduced conflict and ensure appropriate course of actions taken by team
Establish strong leadership	Empower team members with confidence	Promotes the exchange of ideas
Develop team member roles	Provide a safe environment where team members share skillsets	Members identify how their skillsets can contribute to the team in solving the issue
Ensure clear communication	Develop a common language with examples and explanations. Reduce jargon and discipline centered meanings	Reduced conflict and errors in interpreting communications. Increases more efficient and effective communications

Ensure member acceptance	Guarantee each member has an opportunity to interact safely within the team	Reduces conflicts associated with diversity and discrimination. Increases acceptance of differences through sharing of passion in finding solutions to the issue
Transfer knowledge of methodologies	Provide information, instructions, and opportunities to practice design thinking and rapid experimentation	Improves team performance and a deeper understanding of the methodologies that are expected to be utilized in solving the issue
Identify the problem	Facilitates design thinking and rapid experimentation in the initial data collection stages	Improves team understanding of methodologies while providing a deeper focus of the issue and generating leap-of-faith assumptions concerning participants' solution expectations
Transfer power	Provides a team structure, core knowledge of methodologies, and refined team mission and objectives.	Creates a self-managed work team

Interactions with participants is a critical component of rapid experimentation. In fact, without participants, research is nonexistent. In identifying potential individuals as participants, the principal researcher(s) must be familiar with the internal review process (IRP) (i.e., the ethical standards in which researchers must abide when interacting with participants and the data associated with participant research) of the higher education facility or organization involved with the research. As such, teams were composed with two faculty members to ensure compliance with IRP processes, informed consent was given by participants, and participants were treated with dignity and respect.

As part of the training program, the sponsors already secured the first participants to help teams in identifying the problem and potential solutions. In this training environment, it was easy to ensure ethical treatment of participants. When teams became self-managed (i.e., operating outside of the training environment) and engaged with individuals, it was essential to ensure that each participant had direct experience with the issue being investigated. As our issues dealt with substance abuse, significant feelings and emotions (e.g., anger, shame, hurt, sadness, and pain) surfaced that researchers had to interpret and understand. During these critical moments, it was imperative that researchers offer emotional support as this methodology requires a deep understanding of the feelings, the triggering events surrounding those feelings, and the expectations a solution must encompass.

A practical issue encountered in dealing with participants outside of the training environment were transporting the props and ensuring enough researchers were available to act as puppeteers in presenting the product (i.e., an App connecting users to physical safe spaces). The programming and modifications of an App takes a special skillset and time. Hence, the use of props consisting of conceptual drawings (similar to a storyboard) of the App screens helps communicate the idea. This is where researchers as puppeteers becomes important. The puppeteer facilitates product interactions with the participant in an effort to identify the good and the bad experiences with the product.

After experimentations, storyboard modifications were completed. This is a rapid process to learn the successful parts and expedite the failures. Thus, having adequate supplies of prop making materials (i.e., paper, markers, tape, scissors, and sticky notes) is essential and is an important practicality of ensuring quick modifications to the storyboard and a seamless movement to the next participant.

The method of delivering the “experience” of the App centered on a participant’s responses and interactions. As such, secondary data were used in the framing and establishment of the mission and goals of the project. Afterward, the central focus was on primary information with secondary data being used for later refinement of the experience. Moreover, secondary data always yielded to participant experiences.

In the next section, the method in action is discussed.

Method in Action

Solving the substance abuse was a challenge accepted by two teams. Both teams had been provided with the same training and access to the same participants. The end results were significantly different. *Hi Mountains’* conceptual solution was *Second Homes*, a virtual application that connected individuals with social relationships (e.g., brick-and-mortar safe spaces, resources, and professionals offering assistance) that can provide support with a variety of problems associated with substance abuse. *Rapid Response’* conceptual solution focused on prevention through virtual simulation experiences: These negative experiences were expected to deter motivation from substance abuse. Each team’s method in action is presented below.

Hi Mountains

In collecting information in the field from individuals, a majority of participants passionately expressed a desire to become more involved in the development of this virtual application project. These connections, between researchers and participants, were significantly different than traditional research methodologies as participants could be involved in various project permutations. It was these strong passions of the participants that really focused solutions and motivated researchers in finding solutions to the problem. Moreover, with each participant experience, his or her expectations increased, and researchers had to respond with robust solutions. In many cases, researchers failed.

Embracing failures as successes was a critical issue for researchers to overcome as this team desired a successful solution. The team had to learn that early and frequent failures were successes as the knowledge of these failures allowed researchers to pursue alternative solutions. During these earlier failures, it was essential to have designated team member roles that reiterated the project mission and goals and ensure that learning from the information was occurring. In some instances, the team had to retreat and discuss information before moving forward. Communication clarity was indispensable in the project environment.

In deploying this “project environment,” participants imagined the digital experience through prop interactions facilitated and guided by researchers. Although difficult, it was necessary to limit each participant’s experience to approximately 20 min. By limiting these experience, participants could readily discuss and identify delights and disappointments of the project. In turn, solutions and experiences were tailored and refined to highlight the delights and remove disappointments. At first, deploying props and researchers as “tour guides” was awkward, but, through repetition, researchers gained confidence and adapt with this process.

What worked well was researchers were open to new experiences and empathetic toward helping people. Understanding that failures help redirect resources to solutions and that failures were central to finding a viable long-term solution was the most difficult aspect of this methodology. Using low-cost materials (i.e., props and puppeteering) to solve large-scale problems that traditionally used significant cash funding is difficult for researchers to accept. But, passions of participants help researchers reconcile that research on a low-cost budget that collects high-quality information is an effective method in solving problems.

Rapid Response

Divergent thinking is necessary when problems are either ill-defined or overly broad. In seeking answers to the substance abuse problem, a most difficult challenge our team encountered was developing a deep empathy with the participants. As our team was composed of a majority of student researchers, the lack of life experiences seemed to be a barrier. However, a strength of this methodology of rapid experimentation is the consistent interactions with participants and analysis and evaluation of participant information which develops researcher experiences.

In developing researcher experiences, we have to quickly adapt to being part of a collective team with the attention being directed at solving substance abuse. We had to learn how to develop team roles, divide tasks among ourselves, and trust each other. High performance relationships can take 18 months to mature into high functioning teams. As we only had about 30 days, frequent meetings with coaches enriched and fostered team relationships. The coaches were an indispensable element in transforming our team relationships and creating leaders who would tackle the problems.

In developing solutions, we found using brainstorming to generate quality ideas that were subsequently scrutinized provided several hypothesis to be validated or iterated upon based on the information collected. A concern with testing these various hypothesizes was obtaining a significant number of participants who would interact with our project solution and provide meaningful information concerning the experience. From our brainstorming and analysis sessions, we had concluded that *virtual reality* was a central component in this substance abuse solution and we staged a virtual reality experience using paper props instead of equipment. We had no screens to view, only oral stories to illustrate this virtual experience. Unsure of how participants would interact with paper props, we proceeded with our virtual reality experiences and found that participants were highly receptive and appreciative of our efforts in solving the problem. In essence, our sincerity and honesty transformed our oral stories into vivid interactive experiences for participants.

To summarize, the researchers' emotional commitment (i.e., passion) for the project was key to our virtual reality rapid experimentation. Moreover, the coaches facilitated development of our team's high performance relationships and clearly defined task roles which enabled us to quickly evolve and utilize rapid experimentation as experts.

The cases above illustrate that teams working separately on the same problem, collecting information from the same participants, and having access to the same resources can yield various solutions. The next section presents the practical lessons learned by rapid experimentation.

Practical Lessons Learned

In using rapid experimentation to investigate issues, the great difficulty was making the leap-of-faith assumptions. Leap-of-faith assumptions rely on a very few participants whereas traditional research methods involving the collection of data from participants requires information from a greater number of individuals for analysis in postulating outcomes. That is, the overwhelming information will dictate the conclusion. The general concept of *the law of small numbers* notes that assumptions based on few bits of information can yield to incorrect conclusions, and yet, rapid experimentation is based on few numbers.

Even though rapid experimentation relies on a few numbers, its strength is gathering significant information quickly that pinpoint failures and identify expectations toward a solution. Failures stop researchers from wasting time and resources while expectations of participants continue to reinforce the right direction that researchers should follow. This lesson is the most difficult to learn and practice because it is counterintuitive as confirmation from a few sources does not reduce uncertainty in our minds.

Individuals, in general, are risk adverse and do not like to change. Individuals like structure environments where variables are controlled. Rapid experimentation does not seek to control variables but to understand these variables and integrate them into the solution. Solutions are grounded and solidified by understanding a project's failures. We believe that this, *failures are valuable insights to success*, was the most difficult lesson to learn. Through addressing failures, individuals affected by the solution can be delighted as negative experiences are removed when failures are removed.

Finally, understanding that participants, regardless of education and social standing, are considered subject matter experts: *Experience is the teacher*. This is a lesson that seems simple enough but for many, a very hard lesson to grasp. As researchers and as educators, we sometimes allow our own personal perceptions and stereotypes to influence and affect the information being presented by a participant. Subsequently, we misinterpret that information and we make erroneous decisions. To *communicate effectively* is critical. Learning to listen effectively, reiterate the concepts presented by the participant, and acknowledge our (i.e., the researchers') lack of experience and understanding of the issue is critical to building participants' trust and ultimately finding a solution that is powerfully successful. The next sections finalizes our thoughts on rapid experimentation.

Conclusion

Rapid experimentation is an effective method of quickly testing concepts through demonstrations and interactions with individuals. It was through rapid experimentation we learned that in solving problems, we need not have significant funding, resources, or long periods of time to devote to finding solutions. In addition to discovering solutions, our focus was also on finding the failures associated with our project. Understanding and addressing the failures strengthens a solution to a problem.

We believe that rapid experimentation is a methodology that should be integrated within student experiences and employer job training and development programs. Rapid experimentation allows for individuals to utilize cost-effective and available resources (e.g., paper, pencils, tape, and sticky notes) in solving problems using critical thinking skills. Critical thinking skills are essential to creative thinking and sparking innovation.

Finally, in using rapid experimentation as a method of discovery, individuals must understand that *failures are valuable insights to success, experience is the teacher, and communicate effectively*. Thus, individuals must be open to new experiences and not critical of participants. Participants are the focus of rapid experimentation and researchers conduct interactive experiences to discover which experiences delight participants. Thus, rapid experimentation allows solutions to emerge through experiences.

Exercises and Discussion Questions

1. In what ways is the rapid experimentation process different than “closed” processes? What are the advantages? What are the disadvantages?
 2. What skills and mind-set should a researcher have when conducting a rapid experiment? Why are having those skills and mind-set important to the process?
 3. What are some of the logistical, administrative, and practical challenges involved with the rapid experimentation process? How can those challenges be overcome?
 4. Select a significant business or management issue that interests you and design a rapid experiment to solve it.
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Further Reading

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