Note on Extracting Insights

“I call it scratching. You know how you scratch away at a lottery ticket to see if you’ve won? That’s what I’m doing when I begin a piece. I’m digging through everything to find something. It’s like clawing at the side of a mountain to get a toehold, a grip, some sort of traction to keep moving upward and onward.” (Tharp, 2003, p. 95)

“The only true voyage of discovery is not to go to new places, but to have other eyes.” Marcel Proust

Extracting insights requires pulling that data together in different ways, examining it in different combinations and from different perspectives, and identifying patterns and anomalies that lead to problem frames around which unique solutions might be realized. Where does that fit in the overall process?

• In Understand and Observe, you established a research question and collected a lot of data – by reading, seeing, observing, and engaging. For example, you might have asked “How do doctors access their patient files?” and your observations may have yielded the information “Doctors access their patient files in one of two ways – manually, or directly on their laptop computers.”

• In the Extracting Insights phase you seek to identify patterns, assumptions, or unacknowledged opportunities from the data you collected in Understand and Observe. Here’s you’ll ask questions like: “Are there broad generalizations that can be made?”, “Are there underlying beliefs that motivate the actions observed?” or “Are there resources being underutilized or ignored?”. Each insight you generate from asking these questions will take the form of one clear, succinct statement of the form [who] [verb] [what] [why]. For example, “Doctors waste a lot of time accessing patient files, as they either have to look through many paper files or they have to take time to log on and find files in the system.”

• The insights gained can then be turned into statements that will drive the concept generation work in the Ideate phase. Based on one or more of the insights created, you will state what must be included in a solution for it to add value. The form of that statement might be [insight statement], hence the new solution must [verb] [what] [why]. Continuing our example, you might state that: “Doctors feel they waste a lot of time accessing patient files, as they either have to look through many paper files or they have to take time to log on and find files in the system. Hence, a new version of our solution in the health care market must provide instant access to patient files”. We often phrase these as “how might we...?” statements such as “how might we provide doctors with instant access to patient files?” as this creates a generative statement around which to ideate.

• In the Prototype and Experiment phase you will carry that statement to its full conclusion by providing details [how] the [what] will be delivered. In other words, you add a statement that says something like “To [what], we recommend that”. For example, “To provide instant access to patient files we recommend that the company 1) provide a way for patient data to be communicated to and from the cloud and 2) create an easily accessed user interface to do that communication.”
Framing and Reframing

In the Understand phase, we talked about the importance of defining the problem, challenge or opportunity on which you wanted to work. But, we also warned that you were likely to want to change the definition of the problem or opportunity as you worked your way through the process. The Extracting Insights phase is the one in which you are most likely to come up with new ways of looking at your problem or opportunity, a process we sometimes refer to as framing and reframing.

In the Understand and Observe phases, a considerable amount of data is collected in a variety of forms: quantitative data, anecdotal data, field notes, interview transcripts, photographs and video and audio tapes. The challenge in the ReFrame step of the innovation process is to make sense of this vast quantity of data.

Analysis Tools from Quality Management

In quality management (and lean implementations), this is the stage at which, armed with considerable quantitative data you’ve collected on the problem on which you are working, you seek to identify the “root cause” of that problem. There are a couple of tools used to do so.

**Five Whys**

The “five whys” simply suggests that you ask why something has happened five times to get to the underlying cause. The following chart (Liker, 2004) highlights the importance of doing so. The “countermeasures” (a word used in lieu of “solution” in the quality world to indicate that no problem is ever completely solved) you generate depend on the level at which you define the problem, and their effects are more enduring as you reach the level of the root cause of the problem.

<table>
<thead>
<tr>
<th>Problem Statement</th>
<th>Example Countermeasure</th>
<th>Impact of Countermeasure</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is a puddle of oil on the shop floor</td>
<td>Clean up the oil</td>
<td>Short-term</td>
</tr>
<tr>
<td>Because the machine is leaking oil</td>
<td>Fix the machine</td>
<td>Short-term</td>
</tr>
<tr>
<td>Because the gasket has deteriorated</td>
<td>Replace the gasket</td>
<td>Medium-term</td>
</tr>
<tr>
<td>Because we bought gaskets made of inferior material</td>
<td>Change gasket specifications</td>
<td>Medium-term</td>
</tr>
<tr>
<td>Because we got a good price on those gaskets</td>
<td>Change purchasing policies</td>
<td>Medium-term</td>
</tr>
<tr>
<td>Because our purchasing agents are evaluated on short-term cost savings</td>
<td>Change evaluation criteria for purchasing agents</td>
<td>Long-term</td>
</tr>
</tbody>
</table>
Fishbone Diagrams

A more comprehensive look at all the potential causes of a problem can be done using a fishbone, cause-and-effect or Ishikawa diagram. These diagrams start with a statement of the problem (e.g., missed free-throws in the diagram below) at the head of the “fish” and then capture causes on the “bones” of the fish. To complete the “bones” of the diagram, the “five whys” can be employed to get to “root causes” of the problem. Asking why there are so many missed free throws might lead to the answers that people, materials, methods, machines, and environment play a role. Asking why people miss free throws might lead to identifying concentration, motivation and training as issues. Asking why training is at fault might lead to identifying conditioning and consistency. And so on. Root causes that surface as the result of asking why five times across multiple dimensions may prove to be significant to the overall problem.

From http://www.moresteam.com/toolbox/t406.cfm, 9/10/10

These approaches tend to be more analytical in nature, as they seek to break down a problem into its constituent parts. The tools and techniques that come from creative problem solving and systems thinking tend to involve more synthesis. Both sets of tools can be valuable in working towards a new set of solutions for a problem.

Tools from Systems Thinking and Design
Synthesis requires that you see patterns in or make connections between disparate pieces of information with the intent of identifying new insights. An insight is “the act or result of apprehending the inner nature of things or of seeing intuitively” or alternatively, “penetrating mental vision or discernment; faculty of seeing into character or underlying truth” (Dictionary.com, 2010). Gaining insights requires being able to visualize data and information in different ways. Thus, the tools used tend to be visual and allow you to map information such that you have the possibility of seeing something new.
Four general tools that are useful for doing synthesis work include affinity diagrams, mindmapping, timelines and two-by-twos. We provide a brief overview of each here; details on how to use them are included in your Problem Finding, Problem Solving toolkit.

**Affinity Diagramming**

Affinity diagrams are documented in the quality management literature as well as in numerous other places. In short, an Affinity Diagram is a tool that gathers large amounts of language data (ideas, opinions, issues) and organizes that data into groupings based on their natural relationships (Scorecard.org).

Affinity diagrams are useful when you need to:

- Sift through large volumes of data. For example, a process owner who is identifying customers and their needs might compile a very large list of unsorted data.
- Encourage new patterns of thinking. An affinity exercise is an excellent way to get a group of people to react on a "gut level" rather than mulling things over intellectually.

More details on creating affinity diagrams are included in your toolkit.

**Mindmapping**

A mindmap\(^1\) is a diagram used to represent words, ideas, tasks or other items linked to and arranged around a central key word or idea. The elements on the mindmap are arranged intuitively according to the importance of the concepts represented, and allow for classifying related items into groupings, branches or areas (Mind Map, 2010). Mindmaps, as shown in the depiction below, can be used for many purposes: to generate, visualize, structure and classify ideas, to study and organize information, to solve problems, to make decisions.

The argument behind capturing information in the form of a mindmap is that the graphical and non-linear style of a mindmap encourages a less hierarchical and more open-minded view of information. The positioning of items in a radial arrangement disrupts the prioritization of items that comes with more linear representations.

**Timelines**

Timelines can be used to capture and array information of relevance to a study. Timelines provide insights into changes over time, allow us to identify important trends, or simply allow us to see the collection of activities associated with getting something done over a period of time. Clorox, for example, was interested in identifying new opportunities in the cleaning solutions space. A group of students working on the project synthesized the timeline shown on the next page.

The timeline provided Clorox insights into where the market was moving, and how they might have to change their positioning as well as their offerings to compete in the emerging markets.

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\(^1\) The trademark for the word MindMap is apparently owned by the Buzan Organization.
## Cleaning Timeline - General Trends

<table>
<thead>
<tr>
<th>Era</th>
<th>Invisible dangers</th>
<th>Role and perception of Germs</th>
<th>Role and perception of Chemicals</th>
<th>What is “clean”?</th>
<th>Motivations for purchasing products</th>
<th>Product Life Cycle</th>
<th>Products and their purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>ca 1920s-1945</td>
<td>Tuberculosis</td>
<td>Public health initiatives spread knowledge about the causes and possible prevention of common diseases</td>
<td>Medical use of chemicals led to great optimism for the potential treatment of many serious illnesses</td>
<td>No visible stains</td>
<td>Practical need</td>
<td>Repairs</td>
<td>Utility</td>
</tr>
<tr>
<td>ca 1945-1960s</td>
<td>Infections</td>
<td>Improvements in sanitation pushes concerns about germs to the background</td>
<td>Continued progress and development of new “wonder drugs”</td>
<td>Surface shine</td>
<td>Labor-saving</td>
<td>Industrial durability</td>
<td>Labor-saving</td>
</tr>
<tr>
<td>ca 1970s-1990s</td>
<td>Polio</td>
<td>Reduced investment in public health and globalization increases concerns about pandemics</td>
<td>Faith in the health successes of chemicals start to wane. Media fuels suspicion and alienation</td>
<td>Without stains</td>
<td>Instant gratification</td>
<td>Planned obsolescence</td>
<td>Consumption</td>
</tr>
<tr>
<td>2000s-2020s</td>
<td>Mental Illness</td>
<td>Noncommunicable diseases like cancer and diabetes become the main concerns of the Western world</td>
<td>Image of the chemical industry continues to deteriorate while chemicals at the same time are responsible for great advances in computer processor technology</td>
<td>Disinfected</td>
<td>Expression of identity</td>
<td>Partial recycling</td>
<td>Restoration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Chemical-free</td>
<td>Different cleaning requirements for different surfaces</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sources:** 

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*Problem Finding, Problem Solving*

*Berkeley Haas*

*University of California Berkeley*
Two-by-twos
As management experts Joe Pine and Jim Gilmore say, “Too much management thinking today exists in what we like to call a ‘giant list of stuff’ that lacks perspective on the underlying factors that contribute to items making the list, or misses linkages that connect various principles or other phenomena. Therein resides the beauty of the 2x2 matrix. The better ones...force new comparisons, foster fuller exploration of the subject at hand, and fashion creative tension between alternative points of view” (Lowy & Hood, 2004).

“It is tempting to dismiss 2x2 Thinking as stunningly simple and hardly worth the time and study. After all, the structure is self-evident, and the practice seems clear and to a degree, instinctive. Nevertheless, the apparent simplicity of the 2x2 matrix is deceptive. Einstein commented that models should be ‘as simple as possible and no simpler.’ Finding the perfect point of balance can be elusive; excursions of over- and underdevelopment are the norm, not exceptions. The matrix is a clear and helpful starting point to achieving balance and clarity” (Lowy & Hood, 2004).

Two-by-two matrices leverage knowledge of the extremes that exist in a situation, market or industry. Good 2x2s are developed by identifying a set of extremes, and then iteratively pairing them and testing them to find meaningful results. The Problem Finding, Problem Solving toolkit provides more detailed directions for creating 2x2s.

Here are a few examples of the use of 2x2s. A Berkeley student team examining noodle consumption by consumers created the following matrix to look at differences in how consumers think about eating and the interaction between impulsiveness and emotional connection to eating.

**Team Ramen**

**Extracting Meaning**
Two-by-twos may also be used to map the competitive space. The following two maps show the various players in the development of the smart grid, and provide insights into where the gaps and overlaps exist among those players.

Two-by-twos may also be used in concept generation. Another Berkeley student team examining potential solutions for childhood obesity used a 2x2 matrix to facilitate their idea generation efforts. Working with different dimensions of the space forced them to think of concepts outside of the realm in which they had been thinking.

**Childhood Obesity Brainstorming Output**

<table>
<thead>
<tr>
<th>Natural Play</th>
<th>Abstract</th>
<th>High Tech</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tug-of-War</td>
<td>Language Play Pattern</td>
<td>“Nintendo”-style Power Pad</td>
</tr>
<tr>
<td>Obstacle Course</td>
<td>Hands-On Natural Play</td>
<td>Musical Play Balls</td>
</tr>
<tr>
<td>Indoor Monkey Bar</td>
<td>Body Version of DDR</td>
<td>Video Play Balls</td>
</tr>
<tr>
<td>Rock Climbing</td>
<td>Kickboxing/Tai Quan Dao</td>
<td>Automated Scavenger Hunt</td>
</tr>
<tr>
<td>Learning Trampoline</td>
<td>Stability Board</td>
<td>Interactive Hopscotch</td>
</tr>
<tr>
<td>Bike Course</td>
<td>Digital Treadmill</td>
<td>Light Up Twister</td>
</tr>
<tr>
<td>Climbing Balance Balls</td>
<td>“Treasure Hunt”</td>
<td></td>
</tr>
<tr>
<td>Parachute Exercise</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Yogalates Hula Hoop

So, when you are confronted by a large amount of data and are looking for a place to start in sorting through it, you can try affinity diagrams, mindmaps, timelines and 2x2s. All of them are generic tools, useful no matter what problem you are grappling with. More business specific tools can be useful when you are working on, for example, business model design. We turn to a few of them in the following section.

**Business Model Canvas and Related Synthesis Work**

The business model canvas (Osterwalder & Pigneur, 2010) is a synthesis tool. It provides a structure within which you can collect information about an organization’s business model, visualize it and play with it to gain insights into how that business model works.

There are a couple other frameworks that are valuable in evaluating businesses and business processes: process flowcharts, eco-system maps and industry maps.

**Process Flowcharts or Customer Journey Maps**

Less strategic than the business model canvas, process flowcharts are a staple in the quality management toolkit. They “allow a team to identify the actual flow or sequence of events in a process” and can be applied to anything from the travels of an invoice, to the steps in making a sale, to the activities in which a customer is involved around the use of a company’s solution (in which case we often refer to them as customer journey maps) (Brassard & Ritter, 1994). You might even use one to document your own daily routines:
Swimlane diagrams are a particular version of flowcharts that also show who is responsible for each activity or step in the process. Each individual or department is given one “lane” in the diagram and the activities associated with that person or department are drawn in the flowchart in that “lane.” This type of flowchart provides immediate visibility into not only the steps or activities in the process, but also how involved each of the key players is.
Customer journey maps build on process flow diagrams to show the customer’s view of the process. Often they include a graph showing the highs and lows of the process for the customer such as in the example below. A search on customer journey maps yields a wide range of ways of representing them.

http://www.heartofthecustomer.com/customer-experience-journey-map-applying-the-top-10-requirements/

Eco-System Maps

An ecosystem is defined as “a system involving the interactions between a community of living organisms in a particular area and its non-living environment” (Dictionary.com, 2010). Using living systems as a metaphor, business ecosystems are defined as the “loose networks of suppliers, distributors, outsourcing firms, makers of related products and services, technology providers, and a host of other organizations” (Iansiti & Levien, 2004). For the past sixty years or more, markets and hierarchies have dominated thinking about economic organizations; the recent introduction of the business ecosystem organizational form is shifting thinking not only about business strategy formulation, but also about competitive policy, regulation and antitrust actions.

A business ecosystem map is a way of depicting the network of independent entities comprising a market community. It provides a visual representation of the network including all the network members—such as buyers, competitors, distribution channels, and influencers—and graphically represents the relationships of these members to each other. The graphic below shows the players at three levels of the ecosystem: those in the core business, those in the extended enterprise, and those in the broader business ecosystem.
There are many different ways of visualizing an ecosystem map and capturing the desired data. You could simply put all of the players on different post-it notes, and then draw different styles of lines among them to show different types of relationships. Or, simply array the post-it notes in the concentric circles shown above. Another way of drawing an ecosystem map is shown below. More detailed instructions for creating an ecosystem map can be found in your Problem Finding, Problem Solving toolkit.
In summary, there are many, many ways of visualizing information to learn something from it. The few we've included here are summarized below:

<table>
<thead>
<tr>
<th>To visualize any type of information on any project:</th>
<th>To visualize information associated with an organization or business:</th>
<th>To visualize information associated with understanding customers and users:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mindmap</td>
<td>Business model canvas</td>
<td>Empathy map (see Business Model Generation book)</td>
</tr>
<tr>
<td>Timelines</td>
<td>Process flowcharts</td>
<td>Customer journey map</td>
</tr>
<tr>
<td>2x2s</td>
<td>Swimlane diagrams</td>
<td>2x2s mapping behavioral extremes</td>
</tr>
<tr>
<td>Affinity diagrams</td>
<td>Eco-system maps</td>
<td></td>
</tr>
</tbody>
</table>

**Extracting and Communicating Insights**
From the exercise of synthesizing Understand and Observe data, insights can be extracted and the problem or challenge on which you are working may be reframed. There are likely many different insights around which you might restate your problem, requiring a diverging process to collect them all, and a converging process to select the one(s) around which you wish to move forward to generate alternative options or solutions for your problem or challenge.

In quality management, this is the point at which you choose the root causes on which you wish to work first. In a creative problem solving process, this is when you create the value proposition around which you wish to move forward. Converging around a set of insights is not a trivial effort; it often entails generating a range of alternative solutions, taking them back to stakeholders, gathering feedback, and then settling on the most important or relevant ones.

**Point of View**
A point-of-view (POV) is a way of stating your reframing of a problem or opportunity into an actionable statement focused on a particular stakeholder or stakeholder group that will launch the Ideate phase of generative ideation around alternative options or solutions. A good POV statement will allow you to ideate in a directed manner, creating “how might we?” questions that prompt your thinking about new ideas (d.school, 2010). There are several fun ways to create new points-of-view.

**Point of View Madlib**
You can use a simple “fill-in-the-blank” approach to generating a series of alternative points-of-view:

[STAKEHOLDER] needs to [STAKEHOLDER’S NEED] because [SURPRISING INSIGHT]

You can generate many different versions of this statement for your problem, changing each of the variables and combinations of them. For your organization, for example, you might experiment with using the CEO of the organization as a stakeholder as well as the customers and users of the organization. Needs should be stated as verbs, and you should aim to create statements that are actionable and create energy in the team. See your PFPS toolkit for more detail.

**Point of View Metaphor**
This is a good place to employ metaphors as well, as they provide concise and compelling ways of communicating what you want to do. “Personal music player as jewelry” communicates quickly to a design team what its designs should look like. If you were redesigning a workplace, you might extract something like “a works-hard-plays-hard young professional needs to be motivated with a job that is more like a first-person-shooter than like Tetris” (d.school, 2010). And, if you are working on a company you might think of something like aspiring to be “the Nordstrom of fast-food”.

For example, a Berkeley student team was bothered by what they perceived to be poor design of existing alarm clocks. Originally, they thought that people would like to be able to sleep anywhere, and have an alarm to wake them without disturbing others. What they learned through their observations and interviews is that a more important need is to wake in a pleasant and reliable way without disturbing others; they learned about the emotional aspects of waking up, not just about the functional need to be woken up on time. They met their imperatives – simple, emotional, localized – with a flower that opens slowly, increasing the amount of light in the room. Their focus on selected, important and, arguably novel relative to the competition, needs provided them a clear sense of direction for their design work.

**Point of View Want Ad**
Using the format of a want ad gives you a little more room for expression than does the madlib, but still retains a concise format for communication. Here you might state:

- Descriptive characterization of the stakeholder...
- seeks an ambiguous solution to meet an implied need...
- plus additional flavor to capture the insights found

For your organizations, for example, you might have an “ambitious, but poor, young CEO” seeking “new partnerships, new market segments, new value proposition” (think about the elements of the business model canvas here), to “stabilize company profits, grow revenues” (think about the issues you’ve found with the organization), in a “highly dynamic marketplace” (think about the information you’ve gathered around the context in which the company sits).

**Design Principles**

Another way to express the insights that come from the Synthesize phase is in the form of design principles which provide clear guidance to those developing alternative solutions, and yet leave room for creativity around how the solutions will be developed and implemented. Here’s an example. A student team spent a week volunteering at an organic garden store and education center to learn more about extreme users of sustainable products and services. From their intense observation work, they derived a set of design principles for sustainable products:

- A sustainable product works as an integrated system, and tells a convincing story about its life cycle.
- A sustainable product symbolizes being “in” while still allowing for individuality and personal expression.
- A sustainable product conveys the sense of being part of a larger movement.
- A sustainable product competes favorably with mainstream products by being elegant and of high quality.

This set of design principles guided the team’s efforts in creating a handwashing system of re-usable towelettes that could be “recharged” in a system that is aesthetically pleasing enough to hang in the garden.

**Personas and Use Scenarios**

Personas and use scenarios are another way of communicating insights to the team that will generate alternative solutions.

There are two ways to create personas. One uses a real person you have found in your observation work. The other involves creating a composite character profile that is made up from characteristics of multiple people seen in the field. The risk in creating a composite profile is that the team will allow the character to morph to meet the needs of the team rather than having the team morph its solutions to meet the needs of the character. The composite profile, however, does have the benefit of keeping the team from getting hung up on outlying or non-essential traits of a given individual (d.school, 2010).

Scenarios place a persona in a particular situation of interest, and describe it in sufficient detail to bring it alive for the team generating solutions. Here are the steps to using scenarios (Seybold, 2001):

- Envision a particular situation for the customer
- Map out as many variations of each scenario as you can think of
- Think of the individual activities the customer performs and the information needed at every step
How can you use your organization's resources to support or streamline the customer’s activities?

There are many other ways to approach communicating insights to those generation options or solutions, but these give you a sense of some of them.

**Summary**

The Synthesize phase of the Problem Finding, Problem Solving process requires that you take all of the data you’ve gathered in the Understand and Observe phases and use it to:

- Recognize patterns and anomalies, gaps and needs
- Develop insights around which to generate new options

There are many tools for playing with the data and visualizing it:

- Affinity diagrams
- Mindmaps
- Timelines
- 2x2s
- Business model canvas
- Ecosystem maps
- Empathy maps
- Customer journey maps
- AEIOU and its variants

And several means of expressing or capturing the resulting insights:

- Point of view
- Design principles
- Personas
- Use scenarios
References


