The Innovation Machine: Mobile UX Design Combining Information and Persuasion Design to Change Behavior

Aaron Marcus, Megan Chiou, Chirag Narula, and Allan Yu

Aaron Marcus and Associates, Inc., 1196 Euclid Avenue, Suite 1F, Berkeley, CA, 94708 USA
`Firstname.Lastname@AMandA.com`

Abstract. Stimulating and managing innovation in product/service develop-ment is a 21st century global challenge that applies to executives and staff in business operations, engineering, marketing, and design in the US, as well as in Europe, India, and China. The Innovation Machine project of 2012 developed effective ways to foster a shift to individuals, using information and persuasion design to change people's behavior in the short- and in the long-term. This paper explains the development of its user interface.

Keywords: culture, dashboard, design, development, incentives, information, innovation, mobile, persuasion, social networks, user interface, user experience.

1   Introduction

Innovation-management publications, products, and services are available to increase awareness and propel changes. Unfortunately, many of these tools do not focus on innovative data visualization. Furthermore, while mobile solutions are emerging, most tools primarily exist as desktop and web applications. Lastly, these tools lack effec-tive persuasive techniques to convert managers to best-practice solutions and to safe, reliable action plans in the face of new technologies and global economic uncertainty. The question then becomes: How can we better motivate, educate, and persuade people (both leaders and followers) to manage their own innovation practices for future generations of products and services?

The Innovation Machine project of 2012 researched, analyzed, designed, and eva-luated powerful ways to improve behavior regarding innovation management in the development of products and services. AM+A has designed and tested analogous application prototypes: The Green Machine of 2009 aimed to change energy conser-vation behavior in 2009 [Marcus and Jean, 2010], the Health Machine of 2010 aimed to prevent obesity and diabetes through better behavior regarding nutrition and di-abetes [Marcus, 2010]. The Money Machine of 2011 [Marcus, 2012a] aimed to assist retiring baby boomers with wealth management. The Story Machine of 2011 [Marcus, 2012b] aimed to change story-sharing behavior across generations of asynchronous, dispersed family members.

Innovation is not a single 'Eureka' moment. It is not a process that occurs by chance, nor is it a one-person activity. Innovation is a structured process of idea

generation and collaboration that is key to industry success. The Innovation Machine is intended for people from any company, organization, country, or culture, and is intended to assist in the complete innovation process. The platform objectives are:

- Facilitate open discussion of ideas and innovation among individuals and industries
- Combine information design and visualization with persuasion design
- Persuade users to adapt their lifestyles to include better understanding of generating ideas, discussing them, and transforming them into projects.

2   Innovation Theory

Innovation can be incremental, radical, or disruptive. [Carlson and Wilmot, p. 6] define innovation as "a process of creating and delivering new customer value in the marketplace," while the Center of Innovation Studies [Chesborough, 2011] sees it as "a process that transforms an idea into commercial value." For Carlson, innovation should be treated as a process that can be systematically understood and taught to individuals and teams, and ultimately become part of a company's DNA.

AM+A explored two models of innovation, "open innovation" and "co-creation."

According to Henry Chesborough, open innovation is "a paradigm that assumes that firms can and should use external ideas as well as internal ideas… as the firms look to advance their technology" [Chesborough, 2005, p. xxiv]. In this model, firms use internal and external sources of knowledge to turn new ideas into commercial products and services. Firms employing the open innovation model attempt to draw innovations from their own employees, customers, and competitors. This approach contrasts with the more traditional model of "closed innovation," in which companies are more self-sufficient by controlling the creation of ideas via their own research and development (R+D) departments. With the open innovation model, new ideas flow freely among universities, companies, and people.

Co-creation allows actual end-users to take part in creating new products and services. According to Chesbrough, the paradigm shift from leaving the customers out of the innovation process to letting them in has worked for companies like Intuit, Threadless.com, and Lego.

Both open open innovation and co-creation believe active collaboration between groups and people (including end-users) is an effective and efficient way to innovate.

Innovation Process. AM+A researched approaches to innovation and sought to integrate them in a streamlined innovation process that was both clear and comprehensive, suitable for users of varying backgrounds and expertise. One compelling approach was a concept-map of innovation produced by the Dubberly Design Office [Dubberly, 2007]. AM+A noted similarities between that innovation process and the user-centerd design (UCD) process. Thus, AM+A also referenced its own design approach as well as one developed at the Hasso Plattner Institute of Design at Stanford (the "D.School"), which details five modes of the design-thinking process: empathize, define, ideate, prototype, and test. AM+A combined all of the above into its own innovation process:

- **Generate Ideas.** Step 1: Observe the status quo. Step 2: Identify opportunities.
- **Manage Discussions.** Step 3: Develop and discuss user personas. Step 4: Develop and discuss use scenarios. Step 5: Develop and discuss market analysis/competitors. Step 6: Develop and discuss vision/mission/objectives/goals.
- **Implement Project.** Step 7: Find a team/collaborators. Step 8: Design a prototype. Step 9: Test a prototype. Step 10: Refine and edit ideas. Step 11: Finalize and communicate the ideas.

While this process does not guarantee innovation, it provides a researched structure. For the Innovation Machine we sought to include these 11 steps and to stress the importance of people and community in two ways: (1) thinking about the user of a product/service and (2) collaborating with others to discuss/refine a project.

3   Objectives, Goals, and the UCD Process

AM+A's research of innovation models shows any employee, user, or customer can be an innovator and harness the innovation process. To design our application we assenbled a list of UCD objectives and goals:

Objectives

- Collaborate remotely
- Manage projects, check progress, brainstorm
- Find like-minded people, connect, create teams
- Find and share ideas, inspiration, feedback and problems
- Be advised of relevant news, trends, ideas, competitors, *etc.*
- Enjoy a fun and rewarding user experience

Goals

- Develop a process showing the innovation process in terms of steps, timeframes, dependencies, personnel, physical assets (equipment, spaces), and other constraints.
- Develop a dashboard that shows summary indicators and provides brief controls.
- Develop social networking paradigms or components or techniques and resources.
- Develop tips/advice: appropriate tags, taxonomies, categories, and content.
- Develop an open environment for people to discuss new ideas, a platform which facilitates open innovation and co-creation with the stake holders and customers.
- Develop incentives, such as games and challenges for the users with respect to creativity, ideas, and innovations.

AM+A's UCD process involved personas, use secenarios, conceptual designs, and visual designs, with evaluation to obtain feedback. AM+A determined male/female, multi-racial/ethnic personas living in areas of the US, aged 27-32. AM+A wrote textual summaries for all five personas and described their context, behavior, and design implications. These general use scenario topics are drawn from the personas.

Develop/Create Idea

- View/track ideas posted, commented on, or subscribed to in ideation board
- Broadcast problems, reviews, and ideas on an open discussion board
- Evaluate and validate other users' ideas and problems
- Filter through discussions based on popularity and topic (tags)
- Reward users with points for helpful and insightful posts
- Collaborate and brainstorm with others remotely using a virtual whiteboard tool

Manage Idea/Project

- View and track discussions of ideas posted or commented on in the ideation board
- Visualize and track the progress of your ongoing projects
- Create and monitor goals for your projects
- Set deadlines for yourself and/or project team members
- Receive deadline alerts
- View your team and contact team members
- Collaborate with team and hold brainstorming sessions and whiteboard sessions.

Network

- Creating a public profile with contact information
- Exhibit skills, experiences, and interests
- Find and filter through potential stakeholders or team members
- Assemble project teams
- Connect to a broader network of innovators.
- Connect via messaging, emailing, or calling.
- Share your project's progress with a set of people or globally
- Communicate, connect, and work within a specified network per selected filters.

Learn

- Receive daily tips and advice via push notifications
- View tips brainstorming tips while using the virtual whiteboard tool
- Receive relevant articles, blog posts, and resources regarding strategies, trends, competitors, *etc*.
- Filter through articles using tags, searches, folders.
- Share researches, articles *etc*.
- Link to external resources

Gamification

- Gain digital achievements (*i.e.*, badges) for making deadlines, completing goals
- Accept game challenges to brainstorm potential solutions to global problems
- Reward users for helpful posts with points redeemable for reputation status or titles

4   Competitive Analysis

AM+A analyzed screens and customer reviews, to derive major benefits and drawbacks of ten innovation management Websites and smart phone applications, including the following:

- Idea Generation and Management Websites and/or associated mobile applications: Spigit**,** IdeaScale**,** Brightidea Innovation Suite
- Mind-mapping and brainstorming applications: Mindo, Comapping, MindMeister
- Project Management applications: LiquidPlanner.

The competitive analysis showed usable, useful, appealing UI design must incorporate persuasion theory; include incentives to prompt behavior change; have extensive, up-to-date, searchable, user-friendly, easily updatable, and flexible databases for users, their coworkers, and professional acquaintances; encourage and strengthen team-oriented behavior change; and be fun to use.

5   Persuasion Theory

In alignment with Fogg's persuasion theory [Fogg, B. J., and Eckles, D., 2007], we defined five key processes to create behavior change through functions and data: increase frequency of using application, motivate changing some living habits, each how to change living habits, persuade users to plan short-term change, and ersuade users to plan long-term change.

   We also drew from Maslow's A Theory of Human Motivation [Maslow, 1943], which he based on his analysis of fundamental human needs. We adapted these to the Innovation Machine'a context:

- Safety/security needs are met by visualizing the project-progress made
- Belonging/love needs are expressed in friends, family, and social sharing/support
- Esteem needs are satisfied by social comparisons that display success in innovation activity, as well as by self-challenges that display goal accomplishment
- Self-actualization needs are fulfilled by visaualizing improvement and progress

Each of these aspects impacts the Innovation Machine's mental model and navigation, or information architecture.

6   Information Architecture

In the information architecture (IA), there are five primary "modules" or branches:

- **Dashboard.** The Dashboard module is similar to a landing page. It is an overview into the status of the user's behavior change. Here, the user views his/her goals and where s/he stands in achieving those goals.

- **Process.** The Process View module is where the user gets more high-level view of the process and more details regarding each objective and goal. The user sees the progress being made, as well as the next steps in achieving a particular goal.
- **Social Network.** The Social Network module is an integral part of behavior change in modern software. Users engage in focused, subject-matter-based connections with friends, family, and/or like-minded people that either share similar goals or wish to support others in achieving behavior-change objectives. This module was split into two parts: (1) the ability of discuss ideas and potential projects within a community or social network (2) the ability to find potential team members with whom to collaborate more intimately. We called them the Discuss and Connect modules.
- **Tips/Advice.** The Tips/Advice module provides focused knowledge about a given topic to give users insight into the habits they wish to either get rid of or adopt.
- **Incentives.** The Incentives module presents users with a fun and engaging way to change their behavior. Gamification has proven to be a powerful tool in adopting users to try an application, even with virtual incentives, although in some cases, real incentives are provided. In addition, a leaderboard allows a user to compare his/her progress with others, tapping in the competitive nature of the human mind to create behavior change. We added a Settings module and provided a different menu navigation system to keep the screens uncluttered. The high-level basic modules are removed from most screen displays but may be quickly called back to enable users to navigate high-level modules. Fig. 1 shows the information architecture.
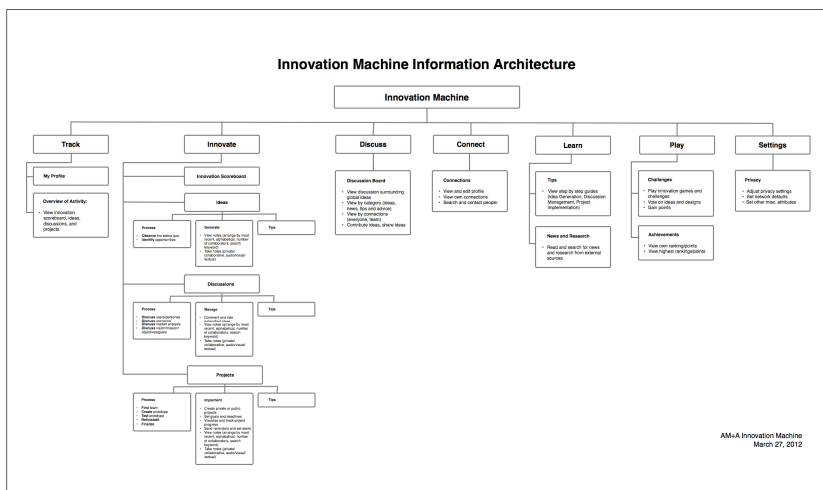
Fig. 1. Information architecture of the Innovation Machine

7   Screen Designs

AM+A designed initial concepts and reviewed them with industry professionals. Based on their comments and internal reviews, we added new screens to fill gaps of flows that were missed in initial screens. In addition, we improved consistency in the visual design of icons, symbols, labels, colors, and grids. Changes include these:

Changs to the Dashboard Module

- Added user's profile with Facebook, Twitter, Google+, messaging buttons.
- Main body shows two of the most recently updated innovations with a button with two arrows that lead the user to the full list of the user's innovations.
- Added section with "current challenges" that include the two most recently updated challenges, with a button below that leads user to full list of current challenges.
- Added icons for each innovation/challenge, plus time-stamps and last-updates.
- Eliminated textual descriptions from each innovation.

Changes to the Innovate Module

- Added Innovate landing page, which displays list of all innovations. Each innovation has a corresponding icon, as well as a visible timeline that displays progress for that innovation.
- Within an innovation screen, added an Overview section at the top that also acts as a button to a more detailed overview.
- Aggregated content in main body to single list that is sortable by tab buttons: All, Ideas, Discussions, Projects.
- Added screen for Innovation Status. User can view status and upcoming steps in their innovation process. Can collapse or expand sections: Ideas, Discussions, Project task checklists. Each task includes a checkbox, info (i) button, and gamification (puzzle) button. Info button leads user to tips and advice regarding that step in the checklist, while the puzzle button leads user to games and quizzes regarding that step *(i.e.,* quiz about team templates for the Find a Team step).

Changes to the Connect Module

- Decreased size of photo to create an overarching grid, consistent across all screens.
- Added icons to items under Education and Experience sections.
- Added Contact, Add Connection, Innovation Reputation buttons to Profile section.
- Combined all alerts to appear in Activity section
- Added Refine button to contacts list in user's network for filtering functionality.

Changes to the Discussion Module

- Changed tab button labels for filtering discussions from Top, New, Featured, Saved to Most Popular, Most Recent, Subscriptions.

- Decreased size of filtering system by removing drop-down menus and adding a search bar for quick filtering, as well as a Refine button.
- Eliminated Favorite button, added icons for each discussion.
- Words "Comments" and "Likes" were replaced with icons. Discussions liked or subscribed to by users are marked by a depressed, white button, rather than grey, indicating the discussion has either been liked or subscribed to by users,
- In Discussions page, the question is featured at the top, rather than the subject. An abridged version of the description is displayed, rather than the full version.
- Eliminated collaboration opportunity message; integrated with the Collaboration button. When discussion host not seeking othres, Collaborate button is greyed out.
- Aligned the Like Message, Subscribe, and Collaborate buttons.
- In Discussions page, added Discussion Highlights displaying most commonly used phrases/words among all comments and added Comments button at bottom.
- Eliminated Compose button on a Discussion page. User must view all comments to access Compose button, so user is somewhat accountable for reading some of the comments before posting an identical comment already contributed.

Fig. 2. Dashboard, revised version of screen

Fig. 3. Innovate, revised version of screens

Fig. 4. Connect, revised version of screens

Changes to Learn Module

- Added Refine button to Learn landing page and source pages for filtering lists.
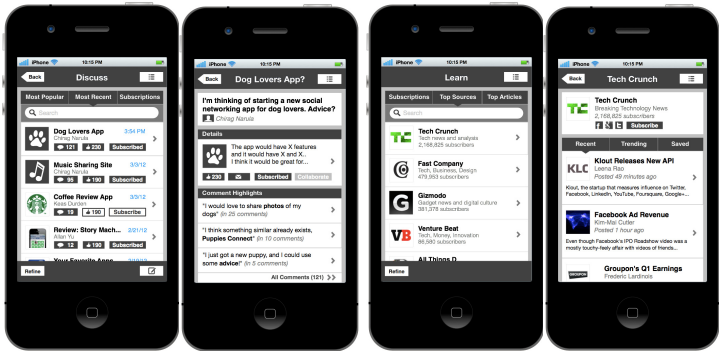- Added Subscribe to Source button for the Learn landing page.

Fig. 5. Discuss screens   **Fig. 6.** Learn screens

Fig. 7. Play screens

Changes to Play Module

- Added a Leaderboard tab, along with My Play and New Play.
- Added medals to represent users' innovation reputation.
- Moved Recent Points section to Personal Points Overview section
- Displayed two current challenges, with All Current Challenges button
- Displayed two completed challenges, with All Completed Challenges button
- In Leaderboard and Innovation Reputation, added photos/medals and point values.

8   Next Steps and Conclusions

Development of the Innovation Machine is ongoing. AM+A plans to revise personas and use scenarios, conduct user evaluations, revise the information architecture and look-and-feel, build a working prototype, evaluate the design and redesign it across different corporate and country cultures, research and design improved information visualization, and develop it for enterprise use and personal use.

AM+A's self-funded (thus limited) development of the Innovation Machine seeks to demonstrate its value and to assist/inspire others. We showed such a process with a previous project, the Green Machine [Marcus and Jean, 2009], versions of which were considered and used by SAP for enterprise software development [Marcus, Dumpert, and Wigham, 2011]. We hope the Innovation Machine has similar success.

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