



# LiquidGoldConcept

*The mission of LiquidGoldConcept is to foster an open exchange of breastfeeding knowledge in order to develop evidence-based lactation education tools for parents and providers.*

## **Proposal**

Without a well-trained healthcare team, many mothers stop breastfeeding. Students in medical and nursing schools in the United States rarely receive breastfeeding training. We propose to incorporate lactation training into the nursing and medical school curricula so that all providers can support and promote breastfeeding. We aim to be the first to design a realistic, affordable, and multi-functional lactation simulator that is paired with a crowd-sourced, innovative, hands-on curriculum. We have spoken with and surveyed hundreds of students and providers to understand what features to incorporate into our simulator. We will develop tailored training modules based on data from our Breast Massage Knowledge Bank (BMKB), the world's first crowd-sourced collection of breast massage techniques, to ensure that families of all socioeconomic and cultural backgrounds have a successful breastfeeding experience.

## **Company Information**

LiquidGoldConcept, LLC was incorporated in the State of Michigan in May 2014. The five shareholders are graduate students and/or young professionals who do not receive compensation for their work for the company. LiquidGoldConcept does not employ anyone; however, the company has engaged in several short-term paid consultancy agreements with translators, filmmakers, and UX designers.

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## **History of LiquidGoldConcept**

Anna, Samantha, and Ileisha met in September 2013 at the first Innovation in Action Competition (IIA) workshop hosted by the School of Public Health at the University of Michigan. As a team, we wanted to design a technology that would improve a mother's breastfeeding experience. After months of talking to physicians, nurses, and mothers, we realized that we should focus on the breast pump. In January 2014, we recruited Jeff Plott, an engineering student, to help with technical aspects of the pump mechanism. Together, we won the competition in the "Empowering the Underserved" category for our innovative breast pump design that combined suction and massage. In May 2014, Jeff, Samantha, Ileisha and Anna co-founded LiquidGoldConcept, LLC.

Over the summer of 2014, Anna spent four months interning in human donor milk banks in the United States and Brazil. In Brazil, she worked with many breastfeeding mothers and maternal/fetal specialists. To her surprise, breast pumps were not the go-to solution for breastfeeding problems. Instead, mothers were taught different massage techniques. After speaking with U.S. physicians, nurses, lactation consultants, and mothers, Anna learned that most are unaware that many lactation problems can be alleviated with hand massage. With this new knowledge and passion, LiquidGoldConcept, LLC pivoted from their original breast pump design and decided, instead, to focus on fostering an open exchange of breastfeeding knowledge to develop evidence-based lactation education tools for parents and providers. Ultimately, we want to initiate a breastfeeding culture shift in the United States.

After 6 months of renewed ideation, customer discovery, and research, we decided to focus on both sides of the spectrum: the provider and the patient. In February 2015, we created the lactation simulation model based on the discovery of a very specific need in the United States maternal and child health care system: the lack of a breastfeeding curriculum in health professional programs. In May 2015, we hired Rachel, a UX design graduate student, to help us develop the Breast Massage Knowledge Bank, the world's first crowd-sourced collection of breast massage techniques. We are in the final phase of negotiation to incorporate her into the company as the Chief Information Officer.

## **Detailed Team Information<sup>1</sup>**

- Anna Sadovnikova, M.P.H., M.A., Chief Executive Officer, Original Founder

*Biography:* Anna is a first year M.D./Ph.D. student at the University of California, Davis. She studies the biology of human lactation, human donor milk banking, and maternal and child health promotion and education. In 2015, she received a M.P.H. (Human Nutrition) and a M.A. (Russian/Eastern European studies) from the University of Michigan, Ann Arbor. For her master's thesis, she wrote about a forgotten model of milk banking from the turn of the 20<sup>th</sup> century in Russia and compared it to various current human donor milk (banking) models and policies in the United States and Brazil. She graduated from the University of California, Berkeley in 2013 with two bachelor degrees in Comparative Literature and Molecular and Cell Biology (with honors).

*Role:* Anna's interdisciplinary academic and research background and years of experience working with people make her well-suited for research methodology development, grant writing, networking, and goal-setting. She is the liaison between the company and

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<sup>1</sup> Detailed curricula vitae for each team member can be provided upon request

investors, providers, mothers, industry, and the media. She oversees the design of the simulation model and the content of the Breast Massage Knowledge Bank.

- Jeffrey Plott, M.S.E., Chief Technical Officer, Original Founder

*Biography:* Jeff's expertise is in product design for manufacturing and business. As a doctoral candidate in Mechanical Engineering at the University of Michigan, Jeff has developed and licensed a number of medical simulators and medical devices. He is also the Chairman and CTO of Flipsi, a reusable bottle company. Jeff received his M.S.E and B.S.E in Mechanical Engineering from the University of Michigan, Ann Arbor.

*Role:* Using his combined knowledge and experience in business and design, Jeff heads up the development of the lactation simulation model.

- Ileisha Sanders, M.P.H., Chief Operations Officer, Original Founder

*Biography:* Ileisha is the mother of two beautiful toddler girls. Before completing her M.P.H. in Health Behavior and Health Education at the University of Michigan, she worked as a lactation educator for the Women, Infants, and Children program. She received her bachelor's degree in Public Health Policy from the University of California, Irvine. She is the supervising health educator for the Merced County Department of Public Health.

*Role:* Ileisha is the only member of our team who has breastfed and has worked as a lactation educator. In addition, her academic background in health behavior and education allows her to design tailored education tools using theoretical frameworks. Ileisha works on our research projects—data collection, analysis, editing—and on outreach strategies to recruit mothers and organizations.

- Samantha Koehler, M.P.H., M.S.W., Chief Financial Officer, Original Founder

*Biography:* Samantha is a licensed social worker focusing on end-of-life care. She completed her graduate education in Health Behavior and Health Education and Social Work at the University of Michigan. She received her bachelor's degree in Movement Science from the University of Michigan, Ann Arbor in 2010. She is the recipient of the prestigious Presidential Management Fellowship and is currently based at the Centers for Medicare and Medicaid Services.

*Role:* Samantha focuses on survey design, development and analysis. She is also responsible for managing finances, taxes, payments, and for all administrative and organizational tasks.

- Rachel Atwood, B.A., Currently the UX & Website Design Consultant. She will transition to Chief Information Officer in December 2015

*Biography:* Rachel Atwood is a 2nd year Master of Health Informatics student at the University of Michigan School of Information and School of Public Health. Her studies intersect UX Design, health communication, and IT implementation. She is also a web developer and has built a web portal for senior citizens in India as a Global Information Engagement Program Fellow. Her focus is on designing consumer facing healthcare applications. She previously worked in nonprofit technology and communications as an Americorps IT Consultant. She received a Bachelor of Arts from New College of Florida in 2008.

*Role:* Rachel leads the technical development and maintenance of the Breast Massage Knowledge Bank and the LiquidGoldConcept website.

## The Need for Breastfeeding Education in the United States

When stratified by race and socioeconomic status, there are significant differences in infant mortality, premature birth and breastfeeding rates in the United States.<sup>1,2</sup> In 2012, the mortality rate for infants born to black mothers was 11.4 while the rate for white babies was 3.4.<sup>3</sup> Breast milk consumption promotes the infant's neurocognitive development and decreases the risk of infant mortality, developing asthma, obesity, diabetes, and gastrointestinal infections.<sup>4</sup> The American Academy of Pediatrics recommends exclusive breastfeeding for 6 months.<sup>5</sup> Yet, in 2012, only 26.9% of non-Hispanic Asian, 24.4% of non-Hispanic White, 20.8% of Hispanic, 13.9% of non-Hispanic Black, and 12.5% of non-Hispanic Indian American, 11.8% of non-Hispanic Pacific Islander infants were breastfed exclusively at 6 months of age.<sup>5</sup>

Many have written about the importance of training all health professionals in lactation so they can support and promote breastfeeding.<sup>6,7,8</sup> Even though simulation-based training is used by over 80% of all medical and nursing schools and by over 40% of all physician assistant programs in the United States, lactation is not a required or available module.<sup>9</sup> In April 2015, we completed a literature review in PubMed using key terms such as: "breastfeeding" AND "simulation" or "simulator" AND "lactation." Moreover, we searched through the Journal of the Society for Simulation in Healthcare for any literature on breastfeeding or lactation; no relevant articles were identified in either search.

Without a well-trained healthcare team, mothers rely on haphazard information from the Internet, friends, and family and stop breastfeeding.<sup>10,11,12</sup> Students in medical, nursing and physician assistant training programs in the United States rarely receive training in breastfeeding procedures.<sup>13,14,15,16,17,18</sup> Hospitals and health professionals rely on lactation consultants to ensure that mothers receive accurate breastfeeding education and support.<sup>19,20</sup> However, in 2013, there were only 3.5 international board certified lactation consultants per 1000 newborns in the United States.<sup>21</sup> Thus, there is a pressing need to develop innovative and efficient lactation education tools to train future health professionals.

### Our Solution

We propose to incorporate lactation training into the nursing and medical school curricula so that all providers can support and promote breastfeeding.

We aim to be the first to design a realistic, affordable, and multi-functional simulator that is paired with a crowd-sourced, evidence-based, hands-on curriculum.



**Figure 1.** First Lactation Simulation Model Developed in February 2015 (left) and The Breast Massage Knowledge Bank (right).

## Part A. How to design a realistic, affordable and multi-functional simulator

### I. Lactation Simulation Market Review and Comparison

The medical simulation market is expected to grow at a compound annual growth rate of 19.1% during the forecast period from 2014 to 2019.<sup>22</sup> A comprehensive report on the medical simulation market is available online for \$4,650.<sup>23</sup> There is no comprehensive database of simulation centers in the United States. In March 2015, we reviewed the website for the Society for Simulation in Healthcare and identified 271 unique simulation centers in the United States.<sup>24</sup> In April 2015, we identified 896 unique nursing (BSN, RN, NP, DNP), 196 physician assistant, 143 allopathic medical (MD), and 36 osteopathic medical schools as well as 400 major teaching hospitals—a total of 1671 potential customers.<sup>25,26,27,28</sup> We know that the University of Michigan School of Nursing has a well-developed simulation center, but it was not included in the Society for Simulation in Healthcare directory of simulation centers. Thus, it is unknown how many of the 1671 potential customers have established simulation centers. Nevertheless, it is clear that all health professionals need to be trained in lactation, thus we assume that the 1671 would require lactation simulation models. Eventually, we aim to sell our model to the Women, Infants, and Children (WIC) program because lactation education is a critical component of the WIC program. In 2012, there were 1900 WIC centers across the United States.<sup>29</sup> Thus, if we sell on average 3 simulators to each program, the total available market in the United States is ~7000 simulators.

To better understand the current simulation market for lactation, we performed a review of 54 medical simulation companies in July 2015 by searching through medical simulation company websites listed in the Simulation Innovation Resource Center website.<sup>30</sup> With this search, we identified two possible categories of similarity: breast cancer and lactation. Only 10 out of 54 companies manufacture products related to lactation or breast cancer. There are three different types of simulators in the market—torso, single breast, and apron—and they range in price from \$60 to \$6,000 (Figure 2).<sup>31</sup>

Current lactation and breast simulators do not accurately represent a real woman's post-partum body (Figure 2). A woman's body undergoes drastic changes throughout pregnancy and after delivery. Many, if not most, medical and nursing students have never seen or worked with lactating breasts. By creating a realistic simulator—with bleeding nipples, swollen or saggy breasts, and copious stretch marks—we prepare students for the variety of normal and pathological phenotypes related to breastfeeding. In fact, our simulator is the only model that, to our knowledge, represents the average American post-partum woman: overweight, with stretch marks, and pendulous breasts.<sup>32</sup> Most importantly, practicing one's interaction with the mother during the vulnerable post-partum stage may be the key to improving breastfeeding success.

### II. LiquidGoldConcept Lactation Simulator Development

Our first lactation simulation model (Figure 1) was created in February 2015 and publically displayed in March 2015 at the Data360 Conference in Dearborn, MI and at SXSW Interactive in Austin, TX. We project that, with our method of manufacturing, we can keep the simulator price at \$3,000. Multi-function simulators in the shape of a torso are sold for anywhere from \$1,850, like the Gaumard NOELLE S552 Maternal Birthing Torso, to \$8,404 like the Laerdal PROMPT birthing simulator.<sup>33, 34</sup> We have completed an extensive patent search and, to our knowledge, we are not using any patented approach or protocol. Keeping the price low is critically important, since we intend to sell our simulator and the accompanying tailored curriculum to the Women, Infants, and Children's program, International Board Certified Lactation Training Programs, community hospitals, LaLecheLeague, and to countries around the world.

Simulator	Company	For Lactation?	Realistic?	Price	Multifunction?
	LiquidGold Concept	Yes	Yes	\$3000	Yes
	Koken	Yes	No	\$1,041	No
	Koken	Yes	No	\$1,041	No
	Limbs and Things	Yes	No	\$1,230	No
	Sakamoto Model Corporation	Yes	No	\$3,522	No
	Laerdal	Yes	No	\$60	No
	Gaumard	No	No	\$230	Yes
	Laerdal	No	No	\$699	No
	3-DMED	No	No	\$205	No
	3-DMED	No	No	\$6,000	No

**Figure 2.** Comparison of Nine Breast Simulators to the February 2015 LiquidGoldConcept Prototype

After speaking with hundreds breastfeeding experts in Brazil, Thailand, and the United States, we designed a survey to understand what features we need to incorporate into a lactation simulation model. In October 2015, we distributed this survey to physicians, nurses, and lactation consultants at the Academy of Breastfeeding Medicine Conference and through our online newsletter. Based on the preliminary results of this survey, we know that the next iteration of our prototype will need to have, among other things: diverse breast shapes and skin colors, a virtual reality component, an accurate representation of various tissues, and the ability to attach and use a breast pump. Other than the Gaumard model shown in Figure 2, which allows for six different breast cancer pathology examples, current lactation simulators only have one function: either breast massage or hand expression simulation.

### **III. Next Steps in Simulation Model Research and Development**

In the next year, we aim to procure enough funding to rapidly prototype a series of lactation simulation models based on the results of our survey. Both the University of California, Davis (UC Davis) and the University of Michigan, Ann Arbor (UofM) Schools of Nursing have voiced their support and intention to work with us on user-testing the prototypes.<sup>2</sup> University of California, Davis medical students will also participate in our lactation training workshops.

During Anna's Ph.D., we will run multi-center case-control trials with UC Davis and UofM Nursing and Medical schools to assess patient satisfaction and breastfeeding success. Students will be divided into two cohorts—cohort A will receive lactation simulation training during week 1 and cohort B will receive training during week 3 of the study. Both cohorts will interact with breastfeeding mothers during week 2 and patient satisfaction and breastfeeding success will be measured and compared between both groups. Students will be surveyed before and after each training module and patient interaction in order to measure their level of breastfeeding expertise.

### **IV. Barriers to Entering the Market**

We are looking for corporate partners with whom we can improve our manufacturing procedure since we are a small company without manufacturing facilities. Even though we have established connections at UC Davis and UofM, we need a partnership with a large company in order to efficiently manufacture and distribute our models. We project that, after completing the aforementioned pilot trials, we can successfully demonstrate that our realistic multi-function model and crowd-sourced curriculum improve patient outcomes. After three years, we will need to partner with another company in order to transition to large-scale sales, marketing, manufacturing, and distribution.

### **V. Initial Revenue Model**

Once we develop a prototype that scores at least an average of 5 out of 7—a 7 means that no further improvements are necessary—on our feedback surveys, we will sell a set of models to interested programs. Until then, we will rely on grant funding as well as funding from the Breast Massage Knowledge Bank (see below) to support our research and development efforts.

### **VI. Marketing the Lactation Simulation Model**

The lactation simulation model does not need to be marketed to the general public, since these models are designed for health professional training. Thus, our main strategy is to gain the trust of leading medical institutions, providers, and simulation center directors. We have already established ourselves at UC Davis and at UofM, both of which were part of the original 11

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<sup>2</sup> Reference letters provided upon request.

medical schools chosen for the AMA's Accelerating Change in Medical Education Consortium.<sup>35</sup> By competing in and (hopefully) winning business competitions, we further establish credibility in the field and our potential for success. We will continue to engage physicians and nurses by presenting our research at conferences, publishing in peer-reviewed journals, renting exhibitor booths at conferences and baby-product events. Finally, we will advertise our model in medical simulation catalogs.

## Part B. How to design and innovative, crowd-sourced, hands-on curriculum

### I. The Breast Massage Knowledge Bank: A participant-centered, data-driven enterprise

Anna Sadovnikova has worked in Brazil, Thailand, and the United States, three countries with very different breastfeeding needs, problems, and solutions. From her conversations with hundreds of providers and parents in these three countries as well as from many anthropological and cross-cultural studies, we know that breastfeeding culture is vastly different from one country to another, thus interventions or educational programs must be tailored to the specific population.<sup>36,37,38,39</sup>

It is becoming increasingly more popular, practical, and efficient to “create open-source data platforms that are broadly available for public access and analysis—in other words, “crowd source” for medical research.”<sup>40</sup> On January 20, 2015, President Barack Obama announced the Precision Medicine Initiative, a “participant-centered, data-driven enterprise supporting research at the intersection of human biology, behavior, genetics, environment, data science and computation, and much more to produce new knowledge with the goal of developing more effective ways to prolong health and treat disease.”<sup>41</sup> This initiative was launched because of multiple barriers that prevent efficient translational research. The following are just some of the barriers identified by Budge et al. that are especially relevant to breastfeeding research: 1) poor outreach and access to minority groups, 2) expenses and lack of funding, 3) no coordinated interdisciplinary collaboration, and 4) policies and procedures that differ across faculties, industries, borders.<sup>42</sup> By developing an online, open-access platform, we can eliminate those barriers. The organization WeBSurg is an example of a successful and well-known crowd-sourced resource for medical professionals that offers first-rate educational content in all fields of minimally invasive surgery provided by world-renowned experts.<sup>43</sup>

The Breast Massage Knowledge Bank (BMKB)—a project we are concurrently working on—is the world’s first crowd-sourced collection of breast massage techniques. Sore nipples, plugged milk ducts, engorgement, and slow let down are all complications of breastfeeding that can be alleviated with breast massage.<sup>44</sup> All of these problems can be painful to the mother and impede breastfeeding. Unfortunately, there is limited research on breast massage techniques and few health professionals and mothers know when or how to use breast massage. Through the multi-lingual BMKB platform, we will collect and analyze input from breastfeeding experts and mothers around the world to create evidence-based breast massage education tools for diverse populations of parents and providers.

### II. A systematic review of breast massage techniques in PubMed and in YouTube

We presented our research on breast massage techniques at the Academy of Breastfeeding Medicine Conference in October 2015 in Los Angeles, CA. Until our work, no systematic review or categorization of breast massage techniques had been completed; thus, it was unclear which technique mothers should use for breastfeeding problems such as: plugged

duct, engorgement, or difficulty with let-down. Our objectives were 1) to identify and match unique breast massage techniques to specific breastfeeding problems and 2) to compare breast massage techniques described in academic literature to breast massage techniques used by and available to the general public. Search terms such as “breastfeeding” AND “massage” and “breastfeeding” AND “engorgement” were used to search for relevant literature in PubMed (from 1965 to April 2015) and in YouTube (first 15 videos per search term). Some articles were identified via reverse snowball and hand searches. Sixteen unique breast massage techniques from twenty-two articles were identified in PubMed. Fifty-one per cent of videos identified in YouTube depicted a breast massage technique that is different from the sixteen breast massage techniques described in academic literature.

We did not attempt to evaluate the efficacy of any breast massage technique since very few studies have discussed whether or not a technique is efficacious.<sup>45,46,47,48,49,50</sup> Well-designed studies are needed to evaluate the efficacy of each technique and the applicability of each technique to different breastfeeding problems. More research is needed to determine whether or not one technique can be used for multiple breastfeeding concerns. Many papers present outdated information and discuss techniques that are no longer recommended.<sup>51,52,53,54</sup> The aforementioned results only include English-language literature. We have hired translators to get a more global picture of the variety of breast massage techniques that exist. Until then, it is unreasonable to make any definitive statements about techniques that originate from a non-English speaking country.

There were several limitations to our study:

- YouTube videos are constantly changing. Due to the subject matter (exposed breasts), many videos are removed by YouTube or by the mother.
- The YouTube videos were not screened based on who uploaded the video—some videos were uploaded by mothers, others were uploaded by organizations or providers
- Only the PubMed search engine was used; thus, it is possible that some relevant articles were missed
- Many resources described in articles found through PubMed are cited as videos, brochures, websites and other, non-academic materials. Many links were not functional, some brochures no longer exist, some articles and books were not available through the University of Michigan Interlibrary Loan System.
- Non-English articles were not included in this analysis.

Thus, there is a need for a standardized, evidence-based resource on breast massage techniques that can be disseminated in hospitals, educational programs, and in mommy blogs and forums. Understanding the efficacy of various breast massage techniques and which technique to use for a particular breastfeeding problem with a specific breast shape may help mothers continue to exclusively breastfeed their infants through six months of life, as is recommended by the World Health Organization and the American Academy of Pediatrics.<sup>4,55</sup>

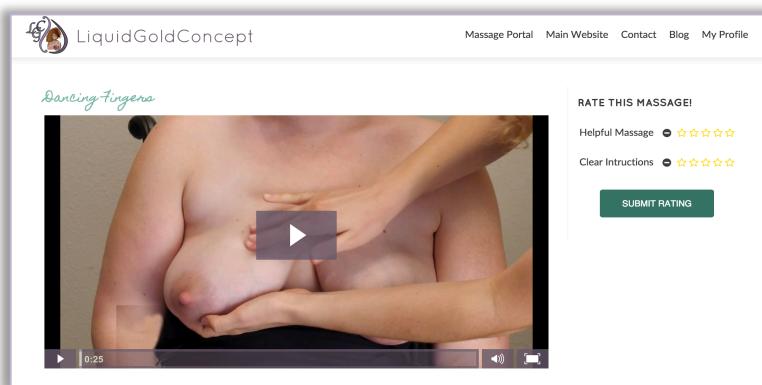
### **III. Customer Discovery**

We have spoken to dozens of mothers and health professionals over the last two years—while participating in the 2013-2014 Innovation in Action competition, while at the 2015 SXSW event, and in milk banks and hospitals in Brazil (2014) and Thailand (2015)—and we know that understanding the efficacy of breast massage techniques is incredibly important to promoting a successful breastfeeding experience all over the world.

At the Academy of Breastfeeding Medicine Conference in October 2015, Anna Sadovnikova interacted with hundreds of physicians, nurses, and IBCLCs. She received a lot of

positive feedback on the BMKB. At this conference and via our online newsletter, she distributed the survey we developed about Breast Massage and Hand Expression Knowledge to over fifty people. The initial results of this survey show that health professionals rely on a plethora of resources—and sometimes, just gesticulation—to explain various massage techniques to mothers.

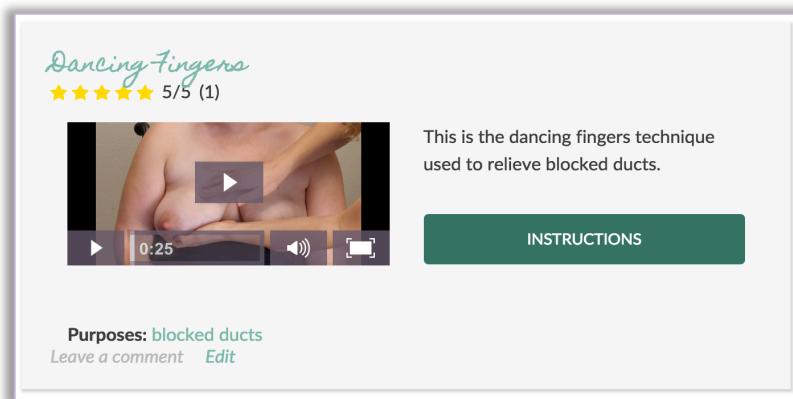
#### IV. Inside the Breast Massage Knowledge Bank: A Preview



**Figure 3.** Inside the Breast Massage Knowledge Bank

When users first log into the BMKB, they will be asked a series of demographic questions. Breastfeeding mothers will be asked to choose an *avatar* that matches their breast shape, size, and color. They will then view videos of the 16 previously identified breast massage techniques (See Figures 3 and 4) that contain models that match their *avatar*. We are structuring the BMKB like this so that mothers are able to relate to the model and, thus, provide more accurate information about their experience with a particular technique. Health professionals will not choose a breast shape *avatar*. Instead, they will view a “variety pack” of breast massage videos, since they have worked with a variety of breast shapes.

We envision three different types of people participating in the BMKB: female and male health professionals and breastfeeding mothers. We consider all of these users “breastfeeding experts” and their commentary on the various breast massages will be sorted, coded, synthesized, and analyzed in order to create tailored, evidence-based tools.



**Figure 4.** Dancing Fingers Technique as described in Bolman M, Saju L, Oganesyan K, Kondrashova T, Witt AM. Recapturing the art of therapeutic breast massage during

will receive techniques D, E, and F. We are filming each technique from two separate angles: from the mother’s point of view and from the provider’s point of view. We hypothesize that seeing the technique from both views will make learning each technique more intuitive for users.

The ultimate goal is to gather a large amount of data that we can analyze to begin to understand which technique is actually useful for a particular breast shape/size and breastfeeding problem (i.e. plugged ducts, engorgement, inverted nipple, low milk supply). We will use the

data collected in the BMKB to generate culturally-appropriate education tools for diverse populations of breastfeeding mothers, for providers to use in their office and in the hospital, and for medical and nursing student lactation simulation training. By gathering data on breast massage from the global community, we can better tailor our end-product to diverse populations. Please, visit our website [www.liquidgoldconcept.com](http://www.liquidgoldconcept.com) to see the ever-evolving BMKB.

## **V. Breast Massage Education Market and Competition**

Since September 2013, we have kept a log of all smartphone applications (app) related to breastfeeding. We have detailed information on the functions, design, and use of 23 free breastfeeding education apps and 7 breast cancer apps. To our knowledge, there is no app on the market that teaches mothers or providers about breast massage techniques. We have also reviewed three large breastfeeding websites: MomForum, The Bump, and BabyCenter, as well as performed an extensive search in YouTube to understand what the general public knows about breast massage. While forums in the websites describe massage techniques, it is done in a disorganized fashion, often times without videos or pictures. Moreover, there is no information on which technique to use for which breast shape and problem. As mentioned previously, our comparative analysis of breast massage techniques on PubMed and in YouTube showed that 51% mothers on YouTube are performing techniques that have never been described in academic literature.

To our knowledge, we are the only company working on standardizing breast massage techniques. Dr. Ann Witt and Maya Bolman of the Breastfeeding Medicine of NorthEast Ohio clinic, Dr. Jane Morton in the San Francisco Bay Area, and the various Oketani massage clinics in Japan are the only organizations or people in the world who are involved in commercializing breast massage or hand expression. Dr. Ann Witt, Maya Bolman, and Dr. Jane Morton have voiced their support of our project and function as unofficial mentors and advisors. The only educational material that resembles our envisioned product is created in Brazil for the human donor milk banking system and in Japan for the Oketani massage clinics. These printed materials/brochures are in Portuguese and in Japanese and are not designed to target specific breastfeeding problems—just general breast massage. Both Dr. Jane Morton and Maya Bolman have made videos with examples of hand expression and breast massage.<sup>56,57</sup> Because we are the first to systematically comb through research literature from 1965-present time on breast massage techniques, we now know that we are the only ones who are attempting to piece together the various techniques that exist globally.

## **VI. “Pay What You Want” as the Initial Revenue Model for the BMKB**

In November 2015, we filmed the first set of breast massage videos. We have begun formatting and user-testing the videos. Based on user-feedback, we will film new sets of videos with models of different shapes and ethnicities. Once we launch the Breast Massage Knowledge Bank (2016), we will generate initial revenue by providing users with the option to name their own price to pay for the resource. In May 2015, Chen et al. described the advantages of a “Pay What You Want” (PWYW) model.<sup>58</sup> They found that by using a PWYW model for their book, they were able to expand their readership by four-fold, while earning at least as much revenue as either of the fixed-priced variants. Briefly, they randomly assigned 5,700 of their email subscribers to 5 separate PWYW and 2 fixed price categories. Each of the PWYW categories had a minimum price (anywhere from \$0 to \$20) and a suggested price (\$19 to \$29). The two fixed price categories were \$19 and \$29. They found that the category of people who received the suggested option of \$0 to \$19 paid nearly twice as much than the category of people who received the fixed price option of \$19.

Our goal is breast massage education, data collection and analysis, and evidence-based education tool development; thus, the PWYW model will allow us to stay true to our primary objective while generating revenue to continue developing, maintaining, and improving the BMKB. By offering the resources in the BMKB for free, we position ourselves in the breastfeeding community as a trusted, evidence-based organization for all socio-economic, racial, and cultural groups.

After we analyze the data we receive in the BMKB, we will work on developing evidence-based tools to sell to lactation education programs, medical and nursing schools, governmental, private, and non-profit organizations. It is too early to predict whether the data we receive will allow us to standardize breast massage techniques. While our hypothesis is that each breast shape and breastfeeding problem requires a unique breast massage technique, we may find that there is no statistically significant difference between different techniques for a particular breastfeeding problem. If this is the case, we will publish the results and the breastfeeding community will finally have an answer to the question: What breast massage technique should we use?"

If our analyses find statistically significant differences between various techniques, we will design both a free version and subscription-based version of a breast massage app that we will sell on iTunes and on our website. Moreover, we will re-imagine the BMKB to showcase these findings.

## **VII. Marketing the BMKB**

Our marketing strategy for the BMKB is two-pronged since we need to both parent and provider support. We already presented our research at the Academy of Breastfeeding Medicine in October 2015 conference where we distributed flyers, business cards, and subscribed many physicians, nurses, and lactation consultants to our online newsletter. We plan on presenting our Breast Massage and Hand Expression survey results and marketing the BMKB launch at the International Lactation Consultant Association Conference in July 2016. Anna is a Sacramento Breastfeeding Coalition member and will be attending the California Breastfeeding Coalition Conference in February 2016.

We are applying to a series of competitions and grants in order to receive funding and to spread the word about the BMKB to the general public. We plan to advertise the BMKB launch through babycenter.com, various radio stations and news sources (from NPR to Shade 45 on Sirius SM), and through social media. During SXSW 2015, Anna discussed the lactation simulation model on the AllOutShow (Shade 45); we intend to use that connection to spread the word about the BMKB launch. Once the BMKB is ready for launch, we intend provide advertising space on our website. We want to promote other start-ups working on breastfeeding technology, like Kohana Inc. a dual-action compression breast pump company, as well as other organizations like the Breastfeeding Medicine of NorthEast Ohio group led by our mentors Maya Bolman and Dr. Ann Witt. LiquidGoldConcept will not advertise for infant formula companies or for companies that receive funding from infant formula companies.

## **VIII. Limitations and Unknowns**

We need to procure funding in order to further develop the Breast Massage Knowledge Bank online platform. Moreover, we need to pay for legal services, liability insurance, and security because of potential regulatory and security issues regarding the Health Insurance Portability and Accountability Act (HIPPA) and the health information we collect from parents and providers. We are in the process of applying for the Health on the Net Foundation

Certification (HONcode). Health on the Net Foundation is a non-governmental organization that verifies that companies provide reliable health and medical information on the Internet.

It is unknown exactly how many users we will have. There were 3,932,181 births in the United States in 2013.<sup>59</sup> Between 2014 and 2060, the US population is projected to increase from 319 million to 417 million.<sup>60</sup> Thus, our total available U.S. market in 2016 is 4 million. The Breast Massage Knowledge Bank is intended to become a global resource, thus, our user-base will expand as we create multi-lingual versions of our platform.

### Part C. How to positively impact the lives of women and families

The 2011 Surgeon General's Call to Action to Support Breastfeeding stressed the importance of training health professionals so that they can adequately counsel mothers on breastfeeding techniques, maternal and child health recommendations, and on strategies to combine breastfeeding and work.<sup>61</sup> Action 9 of the Call to Action outlines the importance of improving breastfeeding content in undergraduate and graduate training of *all* health professionals, regardless of their chosen specialty. Our lactation simulator modules paired with an evidence-based breast massage curriculum will allow for efficient, hands-on training that will improve physician knowledge of and skills in culturally competent breastfeeding management. We intend to sell our simulator and the accompanying, crowd-sourced curriculum to the Women, Infants, and Children's program, International Board Certified Lactation Training Programs, community hospitals, prenatal courses, LaLecheLeague centers, medical and nursing schools, and to countries around the world. By training health care professionals in the basics of lactation support, we can ensure that families of all socioeconomic, racial, and religious backgrounds receive the information and care they need to have a successful breastfeeding experience.

### Part D. Legal and Financial Information

#### I. Ownership Information

Names of owners: Anna Sadovnikova, Jeffrey Plott, Ileisha Sanders, Samantha Koehler, and Rachel Atwood who will officially become an owner in December 2015.

- Percentage ownership (rounded to the nearest hundredth)
  - Anna Sadovnikova: 23.15%
  - Jeffrey Plott: 23.15%
  - Ileisha Sanders: 23.15%
  - Samantha Koehler: 23.15%
  - Rachel Atwood: 7.41% (This is the agreed upon distribution of shares that she will receive when both parties' legal counsel review the paperwork and both parties sign in December 2015)

#### II. Intellectual Property

- The lactation simulation model manufacturing process is a trade secret.
- Anything created for the Breast Massage Knowledge Bank is under copyright protection.
- Once we begin to generate revenue, we will trademark both LiquidGoldConcept and Breast Massage Knowledge Bank
- We own the domain name LiquidGoldConcept, the Gmail account liquidgoldconcept@gmail.com, the Twitter handle liquidGOLDcncpt, and the Facebook page facebook.com/liquidgoldconcept

### III. Financial Spreadsheets

Table 1. Total Revenue and Expenditures since the Company's Foundation in May 2014			
	2014	2015	
<b>Total Revenue</b>	\$3,500	\$10,600	
<b>Revenue Sources</b>	\$2,000 - Innovation in Action	\$5,800 - Owners contribution	
	\$1,500 – JumpStart Grant	\$2,000 - JumpStart Grant \$2,800 - Other Grants through UofM	
<b>Total Expenditures</b>	\$926.96	\$10,428.22	Rationale
<b>Expenditures Defined</b>	\$20.65 - Administrative	\$430.40 - Administrative	Shipping, ordering checks, paying LLC fee, tax preparation
	\$744.13 - Breast pump design	\$30.00 - Breast pump design	Breast pump, nursing bras, female torso mannequins, 3D scans of female bust
	\$162.18 - Marketing	\$216.33 - Marketing	Website domain/website upgrades
		\$2,211.42 – Simulation model design	Materials
		\$3,790.73 - Travel	Flights/hotel/travel while at conference for customer discovery
		\$3,644.34 – Consultant salary	Website design, development of BMKB
		\$105.00 – Research/Publication	Translation of foreign language articles, incentive for participant in breast massage videos

LiquidGoldConcept, LLC was founded as a breast pump design company. Thus our 2014 revenue and expenditures were focused on product research and development. After we pivoted to breast massage education and lactation simulation model development in September 2014, we went through six months of renewed ideation and customer discovery. In 2015, our major revenue was from owner's out-of-pocket contribution in order to bring in a website design and app development consultant (Rachel) and from the University of Michigan grants to develop the February 2015 lactation simulation model prototype. We have made speaking to users and customers and developing our brand a priority by attending the Data360 conference (March 2015), the SXSW conference (March 2015), and the Academy of Breastfeeding Medicine conference (October 2015) and by hiring a UX design consultant.

Our market assumptions were described in previous sections (A.I and B.VI-VII) of this business plan. The tables below are based on those assumptions. Briefly, if we assume that we can sell an average of 3 units for \$3000 per unit to each of the identified 1671 training programs and 1900 WIC centers, then our total available market in the United States is ~7000 simulators. We assume that there is a total available market of 4 million BMKB users in the United States since there were approximately 4 million births in the United States last year.

**Table 2.** Sales assumptions through 2020

**Sales Assumptions - LiquidGoldConcept, LLC**

<b>Period Ending</b>	31-Dec-16	31-Dec-17	31-Dec-18	31-Dec-19	31-Dec-20
<b>Breast Massage Sim Model</b>					
Units	7	210	700	1,400	2,800
% of Market	0.10%	3.00%	10.00%	20.00%	40.00%
Average Selling Price	\$ 3,000.00	\$ 3,000.00	\$ 3,000.00	\$ 3,000.00	\$ 3,000.00
Labor, Burden, Materials	\$ 500.00	\$ 400.00	\$ 200.00	\$ 200.00	\$ 200.00
Distribution to End Customer	\$ 50.00	\$ 50.00	\$ 50.00	\$ 50.00	\$ 50.00
Gross Margin	82%	85%	92%	92%	92%
<b>Breast Massage Knowledge Bank</b>					
Users	5,000	20,000	50,000	200,000	500,000
% of Market	0.13%	0.50%	1.25%	5.00%	12.50%
Average Purchase Price	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00
Labor, Burden, Materials	\$ 3.00	\$ 0.75	\$ 0.60	\$ 0.15	\$ 0.06
Distribution to End Customer	\$ -	\$ -	\$ -	\$ -	\$ -
Gross Margin	70%	93%	94%	99%	99%

**Balance Sheet - LiquidGoldConcept, LLC**

<b>Period Ending</b>	31-Dec-16	31-Dec-17	31-Dec-18	31-Dec-19	31-Dec-20
<b>ASSETS</b>					
<b>SHORT-TERM ASSETS</b>					
Cash					
Cash	\$ 2,000	\$ (54,864)	\$ 13,147	\$ 411,464	\$ 1,423,915
Accounts Receivable	\$ 11,833	\$ 138,333	\$ 433,333	\$ 1,033,333	\$ 2,233,333
Inventories	\$ 3,153	\$ 18,603	\$ 35,343	\$ 65,685	\$ 126,371
Total Short-Term Assets	\$ 16,987	\$ 102,072	\$ 481,823	\$ 1,510,483	\$ 3,783,619
<b>Long-term Assets</b>					
Gross PP&E	\$ 29,100	\$ 29,100	\$ 64,020	\$ 68,676	\$ 109,649
Less: Depreciation	\$ -	\$ 5,820	\$ 4,656	\$ 11,873	\$ 11,361
Add: Capital Expenditure	\$ -	\$ -	\$ -	\$ -	\$ -
Net PPE	\$ 29,100	\$ 23,280	\$ 59,364	\$ 56,803	\$ 98,288
Total Long-Term Assets	\$ 29,100	\$ 23,280	\$ 59,364	\$ 56,803	\$ 98,288
Total Assets	\$ 46,087	\$ 125,352	\$ 541,187	\$ 1,567,286	\$ 3,881,907
<b>LIABILITIES</b>					
Accounts Payable	\$ 1,577	\$ 9,301.40	\$ 17,671	\$ 32,843	\$ 63,185
Debt	\$ 23,100	\$ 56,000	\$ 56,000	\$ 56,000	\$ 56,000
Total Liabilities	\$ 24,677	\$ 65,301	\$ 73,671	\$ 88,843	\$ 119,185
<b>SHAREHOLDERS' EQUITY</b>					
Paid in Capital	\$ (751)	\$ (278,211)	\$ (1,083,978)	\$ (3,151,627)	\$ (7,800,924)
Retained earnings	\$ 22,161	\$ 338,262	\$ 1,551,493	\$ 4,630,071	\$ 11,563,645
Total Shareholder Equity	\$ 21,410	\$ 60,051	\$ 467,516	\$ 1,478,443	\$ 3,762,722
Total Assets - Total Liabilities - Total Equity	\$ -	\$ -	\$ -	\$ -	\$ -

**Table 3.** Balance sheet through 2020

**Income Statement - LiquidGoldConcept, LLC**

<b>Period Ending</b>	31-Dec-16	31-Dec-17	31-Dec-18	31-Dec-19	31-Dec-20
<b>REVENUE</b>					
Total Revenue	\$ 71,000	\$ 830,000	\$ 2,600,000	\$ 6,200,000	\$ 13,400,000
<b>COST OF GOODS SOLD</b>					
Purchases	\$ 18,850	\$ 109,500	\$ 205,000	\$ 380,000	\$ 730,000
Delivery Charges	\$ 70	\$ 2,100	\$ 7,000	\$ 14,000	\$ 28,000
Cost of Goods Sold	\$ 18,921	\$ 111,617	\$ 212,056	\$ 394,112	\$ 758,224
<b>GROSS PROFIT (LOSS)</b>					
Gross Profit	\$ 52,079	\$ 718,383	\$ 2,387,944	\$ 5,805,888	\$ 12,641,776
% Sales	73%	87%	92%	94%	94%
<b>OPERATING EXPENSES</b>					
R&D, Legal and Regulatory Expenses	\$ 5,750	\$ 41,500	\$ 78,000	\$ 117,000	\$ 117,000
Selling, General, Administrative	\$ 10,000	\$ 124,500	\$ 249,000	\$ 498,000	\$ 996,000
Other Operating Expenses	\$ -	\$ 24,900	\$ 52,000	\$ 124,000	\$ 136,400
Total Operating Expenses	\$ 15,750	\$ 190,900	\$ 379,000	\$ 739,000	\$ 1,249,400
<b>EBITDA</b>	\$ 36,329	\$ 527,483	\$ 2,008,944	\$ 5,066,888	\$ 11,392,376
Depreciation	\$ -	\$ 5,820	\$ 11,640	\$ 11,640	\$ 17,460
Amortization	\$ -	\$ -	\$ -	\$ -	\$ -
<b>EBIT</b>	\$ 36,329	\$ 521,663	\$ 1,997,304	\$ 5,055,248	\$ 11,374,916
Debt Interest 15%	\$ -	\$ 3,465	\$ 8,400	\$ 8,400	\$ 8,400
<b>TAXABLE INCOME</b>	\$ 36,329	\$ 518,198	\$ 1,988,904	\$ 5,046,848	\$ 11,366,516
<b>TAX</b> 39%	\$ 14,168	\$ 202,097	\$ 775,673	\$ 1,968,271	\$ 4,432,941
<b>NET INCOME</b>	\$ 22,161	\$ 316,101	\$ 1,213,231	\$ 3,078,577	\$ 6,933,575
<b>OTHER INCOME</b>					
Grants and Competition Winnings	\$ -	\$ -	\$ -	\$ -	\$ -
Total Other Income	\$ -	\$ -	\$ -	\$ -	\$ -

**Table 4.** Income statement (assumptions) through 2020

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