



## Case 94

## Birth Control without Pills or Devices

This article introduces innovations in birth control that shape The Blue Economy, which is known as ZERI's philosophy in action. This article is of part of a broad effort by the author and the designer of the Blue Economy to stimulate open source entrepreneurship, competitiveness and employment. For more information about the origin of ZERI <[www.zeri.org](http://www.zeri.org)>

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### The World Market for Birth Control

The world market for contraceptives was estimated in 2010 at \$15.5 billion and is expected to grow to \$19.2 billion by 2017. The market is increasingly attractive to pharmaceutical companies interested to return to this business since demand over the past decades has proven insensitive to economic downturn. More than half of the couples between 15 and 49 years in the Europe, Russia, Australia, Latin and North America use birth control methods. The use increases to plus seventy percent in the European Union with the exception of Spain. The global market in 2010 for condoms was worth \$4.2 billion. In the developing world sterilization is with 17 percent the most prevalent birth control method. In this geographical area only 7 percent of the couples use oral contraception, 5 percent apply intro-uterine devices (IUD) and only 4 percent relies on condoms. Only 260 million women in the third world have access to birth control. About 215 million are seeking contraception but have no access. These data confirm the potential for market expansion if these products were readily available.

Worldwide, oral contraceptives represent with 78 percent share the largest market, expanding at less than 3 percent per annum. Barrier contraceptives (IUD, vaginal rings and condoms) control a much smaller share but grow at a much higher rate reaching 8.5 percent each year for the next 5 years. There are an estimated additional one million women each three years who require publicly funded birth control, stimulating institutional demand in the OECD. A few pharmaceutical enterprises dominate the market like Bayer Schering Pharma (Germany), Pfizer and Merck (USA), Ansell Ltd. (Australia), Janssen Pharmaceuticals (Belgium) and Teva Pharmaceuticals (Israel). Durex is the global market leader in condoms with 35 percent market share of the branded products. Expanding at a compounded rate in excess of six percent, the Asian market for condoms is the fastest in the world.



Not-for-profit organizations like DKT International (USA) engage in social marketing - the use of modern marketing techniques to achieve social good and not only to make a profit - to sell in 2011 more than 650 million condoms, and to provide 72 million cycles of oral contraceptive servings an estimated 24.5 million couples. Worldwide, this innovative form of marketing to reach couples provides annually already 2.4 billion condoms, and 162 million oral contraceptive pills. Since the products are sold, these are likely used rendering family planning services cost effective and less dependent on abortion which puts the mother at high risk.

### **The Innovation**

The product portfolio of contraceptives faces numerous challenges. Surgical interventions are non-reversible and therefore less popular. The consumption of synthetic hormones with a long shelf life is increasingly causing difficulties for water treatment plants which, even when equipped with high end reverse osmosis are not capable of eliminating all chemical components from water bodies causing possible hormonal disruptions with people (and aquatic life) downstream if waste water is recycled for human consumption or agriculture. Condoms use a non-degradable plastic that can clog toilets and sewage systems if improperly disposed, and decrease erection strength amongst one fifth of healthy men. Cost is also a major concern. Innovative mechanical devices like the Sino-Implant, the SILCS diaphragm, the long lasting NES/EE contraceptive vaginal ring functional for 12 months instead of one reduce the cost price to the buyer and cuts down on the need for external assistance to use the devices. There are quite a few additional problems to solve, like the removal of the devices and the responsible disposal at the end of use.

Jorge Reynolds pioneered the design of the pacemaker in the 1950s and since the 1990s is dedicated to the design of an electro-cardiogram (EKG) without the need for batteries (See Case 4). Dr. Reynolds carefully studied a wide range of applications of the “battery free concept” and realized that perhaps the main innovative application would be to design an integrated mobile, communicating, processing sensor system that empowers women to control their fertility cycles. A woman’s body temperature is usually 36.5 to 36.8 degrees, although the exact number can vary from person to person. During ovulation, the hormone progesterone slightly raises the temperature by 0.1 or 0.2 degrees. While one tenth of a degree may not sound significant one could chart the body temperature every day all day over several menstrual cycles and a pattern emerges over time.

Dr. Reynolds designed a special sensor the size of a rice kernel that can be attached to underwear using a strip of Velcro. The sensor can measure temperature very precisely, day and night and is able to transfer this data to a registered cellphone located in the vicinity of the person. The sensor operates without a battery and is capable of transforming the radio frequency of the nearby cellphone(s) into an energy source powerful enough to measure the body temperature and simultaneously send data to the



phone through a dedicated application which includes a special phone message (SMS, ringing sound, or vibration) indicating that according to the readings of all real time data, and controlled through historical records the chance of conceiving is high.

### **First Cash Flow**

There are numerous family planning applications for smart phones on the market. However none is linked to a battery-free sensor that is equipped with communication capabilities. The existing applications offer a fertility chart which are for recreational purposes only, compiling historical data and personal observations. There are over a dozen apps available including: Women Calendar (\$9.99), iChartMe (\$2.99), MeFertil (\$4.99), FemiCycle (\$2.99), iOvulation (\$0.99) and NFP Manager (free) all providing the core information in a visually pleasing manner. If these applications could combine the proprietary designs of sensors, antenna's and data processing together with detailed smart processing of information by Dr. Jorge Reynolds, then the pattern of body temperature could be converted into a tool for birth control. Actually, the present design of antenna could benefit from the innovations proposed by Johan Gielis (Case 91) based on his superformula.

### **The Opportunity**

Eleven billion cellphones have been sold since this communication device was first introduced in 1994. The past 18 months another one billion have been added. Nokia alone sold 3.4 billion units. Five billion units have been discarded over the years, while 6 billion are in use, of which one billion in China and another billion in India. In many regions the cellphone penetration exceeds 100 percent, meaning that a considerable number of people use more than one phone. Nearly half of the worldwide phones are used in the Asia-Pacific Region, and phone penetration in countries like South Africa is already 100 percent. Africa and Asia have a great interest in and need for family planning. The cost of the sensor is low and will decrease as volume rises. This could become the cheapest family planning device ever imagined. This minute sensor that is readily available on the market will be commercially available in a matter of months. The prototypes produced in Bogotá (Colombia) indicates a price of less than \$10 per unit.

The substitution of chemistry (synthetic hormones) and mechanics (made from precious and rare metals or from polymers) by sensors and software that rely on physics and mathematics, is an example of a Blue Economy innovation. Whereas the substitution of a battery by no batteries like EKG and cellphones would be a great step forward, the introduction of new devices, especially sensors that are critical in improving the health and safety of our daily life that will never need a battery will make our societies not only more sustainable, it will improve the quality, and secure that we are reducing cost while reducing our dependency on mined materials. At an annual cost below the existing family planning devices, it would make it also cheap and within the economic means of millions who cannot be reached through any media, not even social media, but who have access to a mobile phone.



Gunter Pauli is the author of the Report to the Club of Rome:  
“Blue Economy: 100 Innovations - 10 years - 100 million jobs” published in 35 languages worldwide.

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