



# The Fractus case

## David vs Goliath

Date:

### **IMPORTANT NOTE:**

**This case cannot be distributed before the current trial ends up  
(expected in May 2011).**

This case was written by Pere Losantos, UPC, and Xavier Estaran, UPC, with the help of Charlotte Butler, Research Consultant. It was made possible through the generous cooperation of company FRACTUS SA. The case is intended for class discussion rather than to illustrate either effective or ineffective handling of management situations. The development of the case was enabled by a grant of the European Community. Sole responsibility of the case resides with the authors.

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## **Abstract**

In 1999, when mobile phones were still analogue with large external antennas, a group of Spanish entrepreneurs created a company called Fractus to produce small fractal antennas. These were especially suited for the digital telecom market and the company's main assets were some significant patents related to fractal technology, as applied to antennas.

In 2001, Fractus sold its first product to a large Spanish telecom company. In 2002, it established a joint venture with an automotive manufacturer to enter new markets and the following year, opened manufacturing facilities to produce multi-functional antennas for the Asian market in South Korea.

In 2006, disappointing results resulted in the Fractus team taking the decision to combine manufacturing activity with IPR licensing in order to try and improve the company's finances. However, they knew the licensing strategy would be difficult to enforce even though – the entrepreneurs knew - some of the global handset manufacturers were using Fractus technology.

Would RIM, Samsung, HTC and the other major players accept that Fractus was right and that they had to start paying for a license? Or would Fractus just be involved in an expensive fight it might not win? Would they be better off on the long run sticking just to manufacturing?

## **Introduction**

In May 2011 Ruben Bonet, CEO of Fractus SA, sat in his office waiting for an important call from Ron Epstein, CEO of IPotential LLC, an Intellectual Property Rights (IPR) consulting firm. The outcome of the call would decide the future of Fractus and the success or failure of the vision that had led him to join Carles Puente, Luis Fradera, and SRF Moyano SA in creating the company eleven years ago.

Ever since the foundation of Fractus in 1999, IPR had been its main asset. However, it was not until 2006 that the company had taken the strategic decision to think seriously on exploitation of its IPR portfolio. As a result, in 2009 Fractus had generated a profit of €0.7 million - the first time ever.

Another result, and the culmination of this strategy, was a legal "tour de force" in which Fractus sued 10 major handset manufacturers (Including Samsung, LG, RIM, HTC, and Palm) for patent infringement. In effect, Fractus was taking action against all the major players in the mobile phone market except for Motorola, Nokia, and Apple.

Now Bonet waited for the next move from the mobile manufacturers. How would they react? Would they try to reach an agreement, or wait for the outcome of a legal process? To distract himself from thinking about what might happen, Ruben went over in his mind the steps he and his partners had taken that as they Fractus developed from a small spin-off, focused on antenna manufacturing, to its present position.

## **Creating Fractus: the first year**

In 1992, Ruben Bonet graduated as a telecommunications engineer from UPC Barcelona Tech and began an MBA course at IESE in Barcelona. Five years later, working as a

management consultant with the US consultancy then called Arthur Andersen, he found himself managing organizational change and business process re-engineering to facilitate high growth rates in companies in the telecoms, automotive and consumer distribution industries. As he recalled; “That first experience with a consulting firm allowed me to solidify my business background and increase my determination to become an entrepreneur.”

Carles Puente also graduated from UPC as a telecommunications engineer in 1992. However, he then took the research path, studying the topic of fractal-shaped antennas. In 1994 he gained an MSc from the University of Illinois in the US and returned to Spain where in 1997, he gained a PhD from UPC Barcelona Tech. As he explained, “Our research group at UPC was convinced that by applying fractal theory to antennas, the size of an antenna could be dramatically reduced.”

The research team generated several theses on this subject and one patent. In fact, it was the first design patent for fractal antennas applied to mobile telecommunications ever filed. In 1998, Carles Puente and Sistemas Radiantes F. Moyano won a \$230,000 prize for fractal antennas, one of three Grand Prizes making up The European Information Technology Prize in that year.

During their studies Ruben and Carles had become friends but after graduating, did not meet for another three years. With his PhD, the filed patents and the prize, Carles was more quite convinced that fractal theory applied to antennas could be the basis of a business venture. “I knew I didn’t have the right business management knowledge and besides, I’d rather do research than manage. So I called Ruben and we went for a coffee. I explained my ideas and, as a consequence, we spent several months writing a business plan.”

Although excited about the creation of a company, they knew there were several important issues to be resolved. Clearly funding would be needed, but it was not top of

their list. By then, UPC's research group activities were being partially funded by the Spanish antenna design and manufacturing firm, Sistemas Radiantes Francisco Moyano, (SRF Moyano). An agreement between the university and SRF Moyano stipulated that – in exchange for research financing- all IP rights generated by research sponsored by SRF would be transferred to the firm.

SRF Moyano had always been active in R&D and innovation and so when Bonet and Puente went to see its President, Mr Moyano, with their ideas for a company to be called Fractus, Moyano immediately offered to join them as an industrial partner and assigning the IPR to the new firm.

Another piece of the puzzle was to obtain funding. “At that time, it was unusual for technology entrepreneurs to get public funding,” observed Ruben. “Regional policies to foster technology entrepreneurship only began in 2001, so we had to look for other sources of finance”. While at IESE, Ruben had met several private investors and venture capitalists he thought might be interested in sharing the risk, and after several meetings Luis Fradera, a business angel, decided to invest in Fractus.

"The negotiation process for the incorporation of partners was an important learning experience," recalled Ruben. “Our university courses didn't cover legislation and managing IP rights or how to deal with spin-off equity participation, so we learned it on the hoof. And undoubtedly, the most important thing we learned was that trust between partners was essential to the survival of a company like ours."

In that timeframe, the participation of the Professor from the IESE Business School Juan Roure was also key for us. “He provided to us basic guidance and coaching, which together with contacts helped us to maximise the chances to do the things right from the very beginning.” Just after the creation, Juan Roure became a shareholder and board member of Fractus.

Fractus SL was incorporated in March 1999. Puente and Bonet together held a 60% share of the company. SRF Moyano took another 40% and later in October 1999 Luis Fradera, the business angel, invested around €1 million in return for a 25% stake diluting the prior ones.

## **Technology and IPR**

From the early 1980's, the Department of Signal Theory and Communications (TSC) at UPC had carried out research in the area of telecommunications and its applications. One of the recurring themes in antenna theory was antenna scaling, which posited that if all dimensions and wavelengths were scaled by the same factor, then all the properties of the device must also remain the same.

A fractal is a figure that “looks” the same at different scale levels. Combining these two theories seemed quite powerful, and the research group realized that a fractal- shaped metal element could be used as an antenna over a very large band of frequencies.

The key point was that Fractal antenna technology was geometry- not material-based (Exhibit 1). Therefore, fractal antennas could be manufactured from standard materials and substrates, using standard processes. For Fractus to produce fractal antennas, therefore, OEMs, ODMs and CEMs were able to take advantage of maximum flexibility and cost-effectiveness, from design through to final assembly, with no need to change processes or deal with special materials.

By 1993, building on the work of the UPC research group, Puente applied properties of fractal geometries to the development of fractal antennas. In this way, multiband antenna performance was achieved with minimum antenna space. To protect the idea and technology, the first patent for fractal antennas was filed by UPC in May 1995. The authors were Carles Puente together with fellow UPC researchers Rafael Pous, Jordi

Romeu, and Xavier Garcia. “This first patent might be poorly written”, smiled Puente, “since we had no experience on this topic.”

In 1998, another important patent was filed to protect the multitriangular antenna technology in one device. In 1999, UPC licensed the technology to Fractus for its exploitation within the company. From the beginning, Fractus established cooperation agreements with the UPC Barcelona Tech group with whom Puente had worked, collaborating with them on several research projects. "Protecting the results of these partnership projects is essential. What you gain in capacity and power, you can lose through poor IPR policy," observed Puente.

### **The market**

In late 90's, Puente and his colleagues envisioned the potential application of Fractus antenna technology to mobile phones. Its key benefit was that the reduced antenna size enabled the manufacture of smaller phones. As the number of mobile phones was beginning to increase, this would clearly be an attractive market (Exhibit 2). However, its exponential growth attracted keen competition and it developed rapidly. Fortunately, every development tended towards miniaturization, multiple bands in one device, and higher antenna performance.

Demand meant that the industry, which included established players such as Nokia and Samsung, brought out new models each year. This in turn meant the introduction of one new technology after another (Exhibit 3). “We soon realised that competition was intense - some of the larger mobile manufacturers such as Siemens or Philips, no longer operate in this sector. To us, this proved that sales were not just based on good technology.”

As the devices became smaller and included multiple frequency bands (GSM900, GSM 1800, PCS, UMTS, WiMAX, Bluetooth, GPS) use of the phones spread to many different countries. Puente considered these trends as far as possible developed products and

applied for new patents for each of the application areas, including mobile phones, short range wireless mobile devices, WLAN coverage for indoor base stations, RFID tags, antennas integrated in chips (AIP), automation, health and defence products (Exhibit 5).

## **The competition**

Although antenna science and technology was quite old, fractal theory was not defined until 1975 by Mandelbrot<sup>1</sup>. The new idea of applying fractal theory to antennas could have originated in many different parts of the world. In fact, Nathan Cohen, a US physicist and radio astronomer, claimed to be the first to come up with it. The founder of Fractal Antenna Systems Inc., in 2001 he asked Fractus to halt its sales of fractal element antenna products in the United States. “The point about fractal element antennas was quite simple from my point of view”, stated Cohen, “We came up with the innovation; we acquired patents for it; we sell the innovation as products. Protecting our IP is in the best interests of our customers”.

To protect his findings, Cohen had filed the first of three patents on the 5th August 1995. Puente, however, had already protected and patented his findings by taking out at least 12 patents, the first one on 19th May 1995, three months before Cohen. Fractal Antenna Systems was not, therefore, able to pursue its claim. The episode strengthened Puente’s belief that it was key to build a strong patent portfolio.

More serious competition came from established Telco’s such as Motorola, Samsung and LG. In developing new telephones, they followed the newest technological trends and use Fractus technology in their devices. Large electronic manufacturing firms, such as the US firm Tyco Electronics, supplied many mobile phone parts, including antennas. As the mobile telecom sector matured, the industry began to consolidate. As the big companies

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□ [http://en.wikipedia.org/wiki/Beno%C3%AEt\\_Mandelbrot](http://en.wikipedia.org/wiki/Beno%C3%AEt_Mandelbrot)



acquired smaller ones, life for a small start-up like Fractus became more difficult. The large companies could develop their own technology or use Fractus proprietary technology. This meant that in order to protect its IP rights, the only choice left to Fractus would be to enter into litigation. This would involve a huge financial outlay.

### **Investment and funding**

Fractus' first investments after the seed capital coming from the founders came from Luis Fradera and a Barcelona venture capital fund, BCN Emprèn, which invested over a million euros in the company in 1999. Two years later 3i Group<sup>2</sup>, a leading global venture capital firm, invested €2.3 million. But the main capital increase came in 2002 when Apax Partners<sup>3</sup> put in €6 million and 3i Group invested a further €2 million in the company.

"3i supported Fractus from a very early stage," recalled Carlos Mallo, 3i Local Head in Barcelona. "By investing another two million in the 2002 financing round, we signalled our confidence in the project's strong growth potential. We believed Fractus would become a key technological reference in its field, and wanted to support the company in achieving this objective."

Javier Abad, Apax Partners' Head in Spain, added that: "Fractus was the perfect example of the kind of company that Apax Partners seeks to invest in at an early stage: a company which has developed a proprietary, disruptive technology and has the potential to become a global leader in its industry. In 2002, Fractus was still in the development stage and needed to expand its 'footprint' worldwide in order to capture the benefits of its technological advantage." In 2002, Fractus further increased its financial base with a €0.9 million shareholder loan from ENISA, a publicly-held company. Part of Spain's Ministry

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2 <http://www.3i.com/>

3 <http://www.apax.com/EN/>

of Industry, Tourism and Trade. ENISA granted SMEs long-term funding to enable them to strengthen their financial structures.

Additional public funds were raised in 2006, when the same Ministry gave Fractus another grant through the PROFIT Programs<sup>4</sup>. This enabled the company to continue its groundbreaking R&D activity in designing and developing fractal antennas worldwide for the telecoms industry. In 2007 another venture capital firm - Nauta Capital - made an investment in Fractus. Between 1999 and 2010, Fractus raised over 20 million euros, contributions from private firms and public funds being complemented by investment from team members and company partners.

## **Business model evolution**

Looking back, Bonet realized that: “Although over the past 10 years we have modified our business plan several times- either because the technology, the market or ourselves changed - our vision has remained constant. Our technology provides an excellent way to achieve miniature multiband -GSM, GPS, Bluetooth, WLAN 2G, 3G- antennas.”

## **Manufacturing**

At the outset in 1999, Bonet and Puente’s idea was to develop, design, build and test their own antennas so that Fractus could manufacture its own products. At that time, mobile phones were GSM analogue, with a large antenna attached to the body of the phone. “But,” recalled Bonet, “because we were at the cutting edge of research we knew that batteries would grow, screens would be larger and that antennas would be smaller and multiband, - as we know them today”.

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<sup>4</sup>PROFIT Programs - Promotion of Technical Research Programs - were instruments through which the spanish government articulated a set of public grants, designed to encourage businesses and other entities to carry out research and technological development

However, it was not until 2001 that Fractus sold its first product to Telefonica, a large Spanish telecom company. The route from patent to product was not easy. First, they had to complement the research staff with mechanical and product engineers. The final goal was to have at least 50% of staff devoted to R&D, leaving commercial tasks to be carried out by distributors.

Secondly, they decided to subcontract production instead of building their own facilities. A cluster of firms located near Barcelona was the first to provide technology and process support. “This was an easy way for a spin-off to operate, since we got the knowledge, without paying for it, before making any sales” said Bonet.

Finally, they had to choose a product and a market, a hard decision as the founders discovered. “When you are a small spin off you can easily fail if the first choice is not the right one. For us, it was crucial to develop our first product in collaboration with a partner.” To reduce the risk of failure Telefonica engineers worked closely with those at Fractus, allowing them to follow common specifications.

For almost eight years Fractus continued with this manufacturing method, although the local provider was replaced by Asian manufacturers. Otherwise, the process remained basically the same. “The only place we tried a different model was in South Korea and China, where we established a factory to provide multi-functional antennas for the Asian market in 2003. At that time, the Asian market was exploding as consumers demanded the next generation of mobile services. We thought our Asian customers deserved efficient customer service to respond to their evolving needs, so a Fractus office was set up in South Korea to provide personalised service and technical support.” said Ruben Bonet, adding, “Unfortunately, the Asian market did not develop as expected, so we closed down the facilities in 2007.”

## New markets

Since telecom applications involved a “wide spectrum” technology, Fractus could choose between several market opportunities. The first product for Telefonica – a 900/1800 MHz base station - was the first to be brought to the market and substantial resources were allocated to it. Puente and Bonet wanted to enter a second market sector but, feeling they could not do this alone, decided to try and establish a joint venture. They chose the automotive industry, a difficult one because of the long development cycle - 4 years - and the scarcity of clients, who were few and powerful.

“We analysed the different partnership options and scenarios,” Bonet recalled, “and finally we chose Ficosa.” Ficosa<sup>5</sup> was a Spanish multinational corporation devoted to R&D, production and the sale of systems and car parts for both commercial and industrial vehicles. Founded in 1949, the company’s headquarters were located near Barcelona, close to Fractus. Ficosa had production and engineering centres and commercial offices in 19 countries throughout Europe, North America, South America and Asia. In 2008, it had a turnover of 897 million Euros. With such an experienced industrial partner, the founders felt that they could be confident about entering a new and challenging market.

A3 –Advanced Automotive Antennas- was established in 2002 as a joint venture between Ficosa and Fractus to develop and commercialize fractal-based antennas for the automotive sector. “Although we usually took 51% of the equity,” Josep Ma Tarragó, Vice-president of Ficosa explained. “But we considered Fractus a very special and strategic investment, so we agreed to share the equity 50% each.”

The experience was successful. Fractus provided technical services and Ficosa the commercial ones. “Large customers, such as BMW, were used to dealing with Ficosa rather than Fractus, which employed too many young people. They needed to feel confidence in the product and the labs. Imagine, if BMW decided to install a Fractus

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<sup>5</sup> <http://www.ficosa.com/wps/portal/corporate/>

antenna on its 5 series and suddenly, as a spin off, Fractus failed or disappeared. Who would take care of the technology? So, the visibility and confidence of a long-term supplier with a previous record is always necessary if you want to enter the automotive industry,” remarked Tarragó. But A3 was only a joint venture for one of the many products Fractus was developing and in the end, proved too expensive to maintain. In 2005 the Fractus board and investors, by then consisting of 3i Group and the Apax partners, decided to focus on certain products and markets and exit others.

In July 2005 Ficosa and Fractus reached an agreement by which Ficosa became the sole proprietor of A3. The agreement also gave Ficosa an exclusive license for Fractus’ antenna technology in the automotive sector worldwide. The acquisition of Fractus’ 50% share of A3 allowed Ficosa to integrate the business into its corporate structure, increase its product portfolio and build more effectively on the penetration the Fractus antenna technology had already achieved in the international automotive sector.

“After that first agreement we expanded into other fields such as aeronautics or defence,” observed Tarragó. “For us at least –and I think for Fractus, too - it was an interesting experience and a good investment. Most of the A3 engineers are still there and we are now selling rear view mirrors (Ficosa’s main product) with fractal antennas. We have opened new markets based on this technology.”

### **IPR licensing**

“By 2006 we begin to have a strong patent portfolio and, although continuing antenna manufacturing for the telecom and automotive sectors was not a bad business, wanted to complement the exploitation of our technology in a different way,” Ruben Bonet recalled. “We learned that technology and performance are sometimes the least important reasons for a company to buy your products, even if they are the best”. “Technology gives you an opportunity, but you have to be prepared to take advantage of it” added Carles Puente.

Fractus carried out an exhaustive benchmarking exercise of companies whose business model was based on the exploitation of IPR. Established players in the electronics industry like Qualcomm, Interdigital, Tessera and Rambus, were clear examples of what could be done. “Qualcomm’s share value is nine times that of its sales, where for a typical consultancy it is only two to one. The Fractus IPR portfolio was, of course, not comparable to that of Qualcomm - 50 to 7000 patent families- but they were a small company once - so why shouldn’t we try to follow their model?” demanded Puente.

In 2006, the Fractus management decided to launch a new, additional market strategy, while maintaining manufacturing, so giving them two income sources “which is not uncommon in the telecom sector”, remarked Puente. “Qualcomm itself manufactures wireless devices and licenses technology, although the second business unit is much more profitable than the former” (Exhibit 4). He recalled that “the first day after we created Fractus, Bonet told me to spend the first year just in inventing new technologies and writing up and filing patents and luckily, I believed him. So, the market focus and technology placement may have changed, but not our vision of IPR management, which was there from the very beginning.”

In Nov 2008, Fractus decided to partner with IPotential LLC. Founded in 2003 and based in California, the company offered patent owners expertise in patent transactions and intellectual rights. Fractus also hired the services of US world-reputed law firms like Heim Payne & Chorush L.L.P., and Susman Godfrey L.L.P.

## **Future trends**

Several aspects of Fractus have changed during its eleven years of operation. “We began with Ruben working full-time, and me part-time” said Carles Puente. “By 2003, we had grown to 70 people including the South Korean office but then, in 2009, reduced our numbers to less than 20 - which is not necessarily a bad thing. With 15 people our sales

are three times those we got with seventy, and our productivity is much higher. Our investment needs have also changed because selling licences is less capital intensive than manufacturing and selling devices. But remember, we've been able to raise €20 million from both public and private global venture capital which is really uncommon, at least in Spain.”

Puente summarized the Fractus business as follows; “Our customer portfolio is composed of roughly a thousand companies, mainly wireless device manufacturers such as mobiles but also, for instance, remote control devices, although we have sold to different sectors over the years. Our accumulated income over amounts to €30 million, half of it due to IPR licensing since we enlarged our business model with IPR exploitation.”

In May 2009, telecom industry newsletters were excited by the fact that an unknown Spanish company, called Fractu, was suing no less than ten mobile phone makers (including Samsung, LG, RIM, HTC and Palm) for patent infringement. Fractus claimed that the phone makers were infringing some of its patents relating to internal antennas for cell phones. As the leading weblog, [Unwired view](#), explained:

“Fractus was an early pioneer in developing internal antennas for cellular phones and other industries, and holds over 80 patents worldwide - 30 of them in the United States – where the suit against the ten handset makers was filed. No other details have been given, but the declaration of Fractus’ lawyer does not bode well for Samsung, LG and the others. It is courageous of Fractus to fight these cell phone companies, many of whom knew about Fractus and its technology yet still continued to infringe its rights. Fractus’s inventions have added tremendous value to both the cell phone user and the manufacturer.”

In April 2010, almost a year after announcing the lawsuit, Fractus announced that it had reached an agreement with Motorola, although the financial details of the deal were not disclosed. “This deal represents a major milestone in our efforts to obtain recognition for

the valuable technology our company has developed and brought to industry,” declared Bonet. Some other sources commented that Motorola’s acceptance of a deal with Fractus seemed to confirm the truth of the Spanish company’s claims of patent infringement. If the Fractus team took an optimistic view, then this outcome might mean that other phone makers, too, would decide to reach an agreement with them.

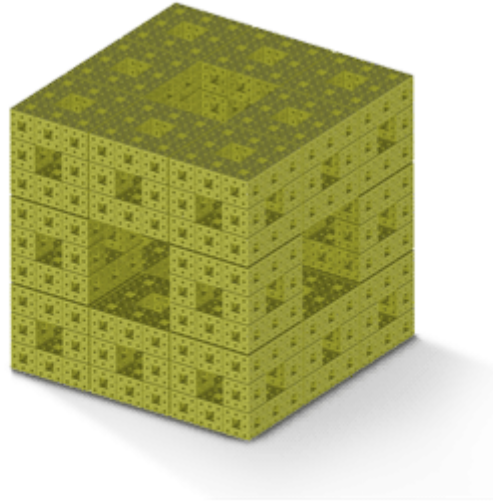
The future of Fractus would be largely influenced on the reactions of the other Telcos to the Motorola agreement. Fractus had developed valuable IPR assets since 1999, but established players in the mobile phone market had failed to acquire a license to use the company’s technology. Now, Fractus was demanding recognition of this fact and, as the Motorola agreement demonstrated, getting it.

So should the team conclude that in exploiting their IPR rights they were on the right track? Were Bonet and Puente being very smart in adopting this strategy, or would they be better off on the long run staying as just a manufacturer? In other words, would a small spin off –David- prove able to fight against the telecom Goliaths - and win conclusively? Or would Goliath return with another stone in his armoury?

At that moment, the phone on Bonet’s desk began to ring.....

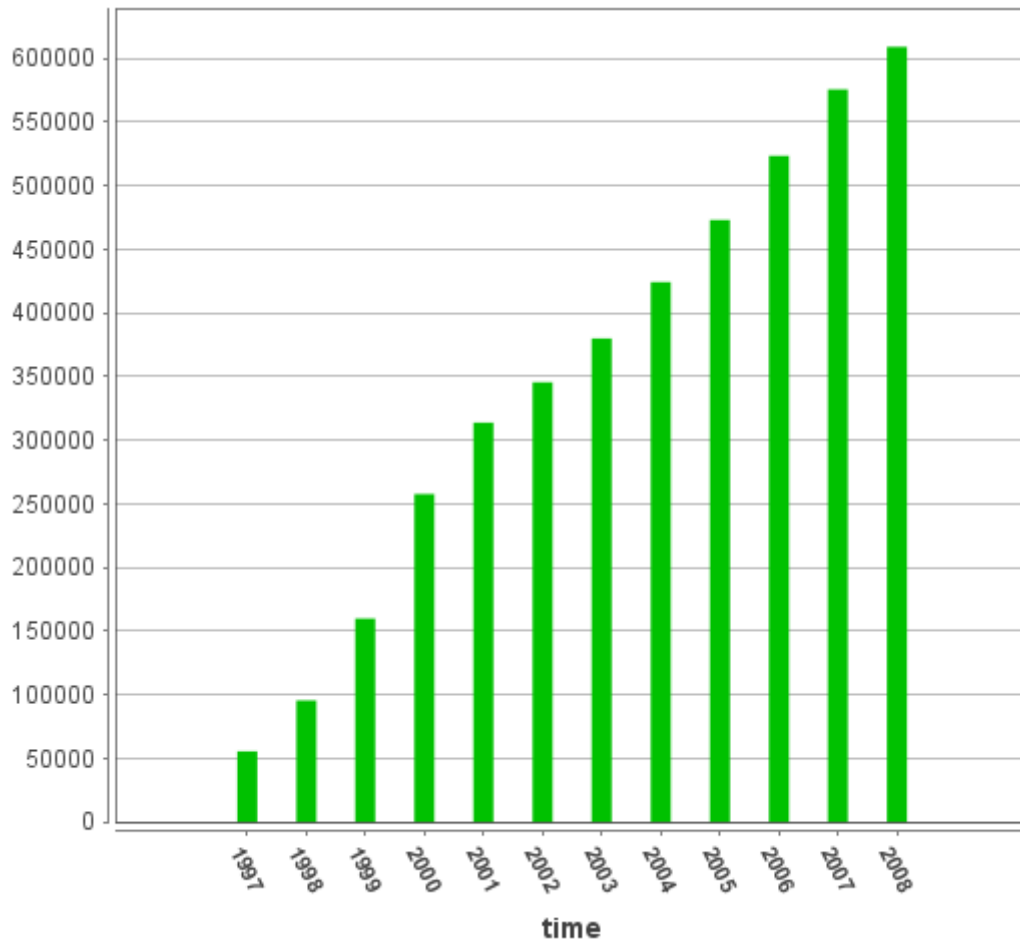


**Exhibit 1**  
**Fractal antenna shape**



*Source: Company information*

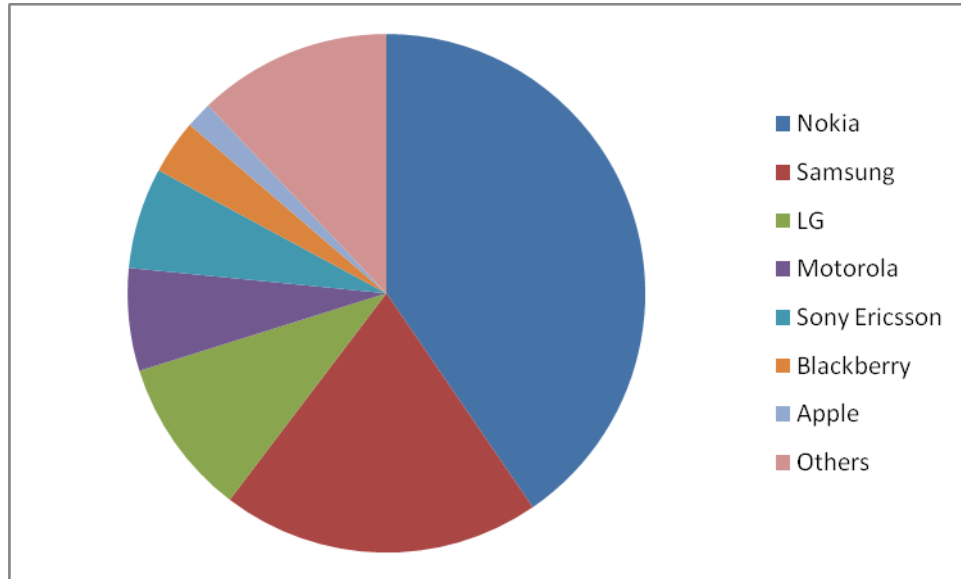
**Exhibit 2**  
**Number of mobile phone subscriptions (x1000) in**  
**Europe (27 countries)**



*Source: Eurostat*

### Exhibit 3

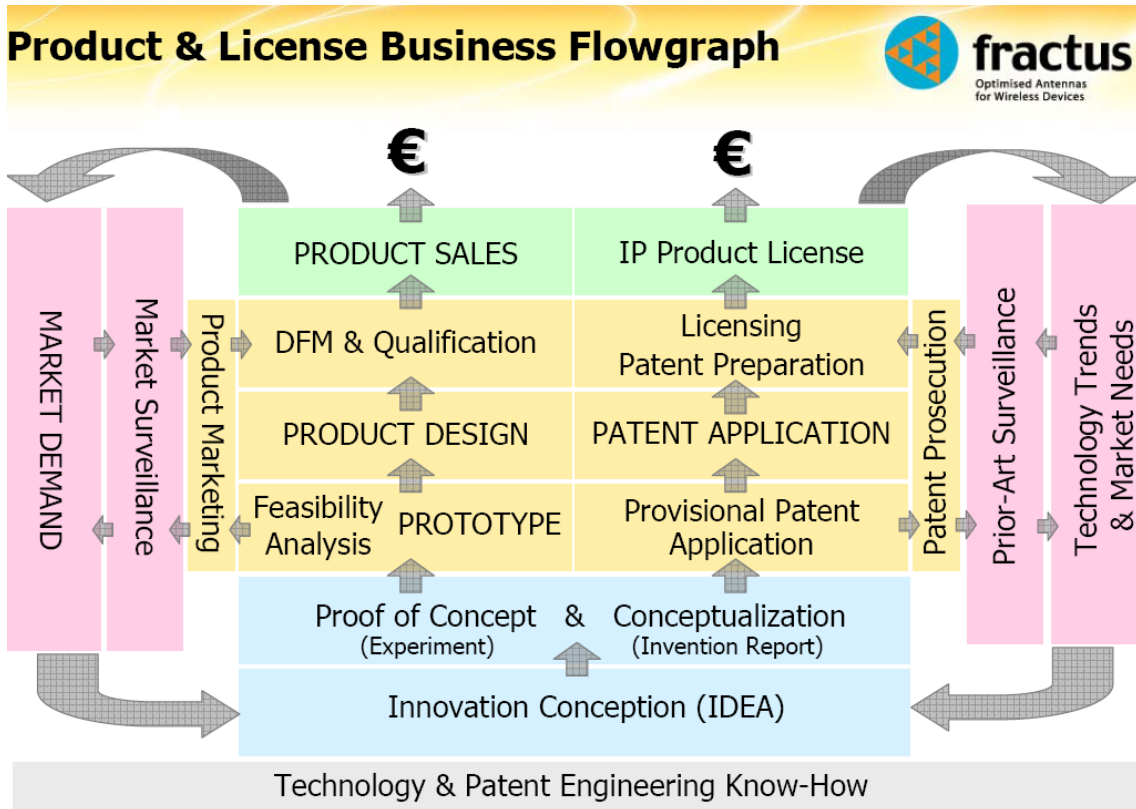
#### Market shares for mobile phone handsets (March 2009)



Source: <http://www.mobileisgood.com/statistics.php#current>

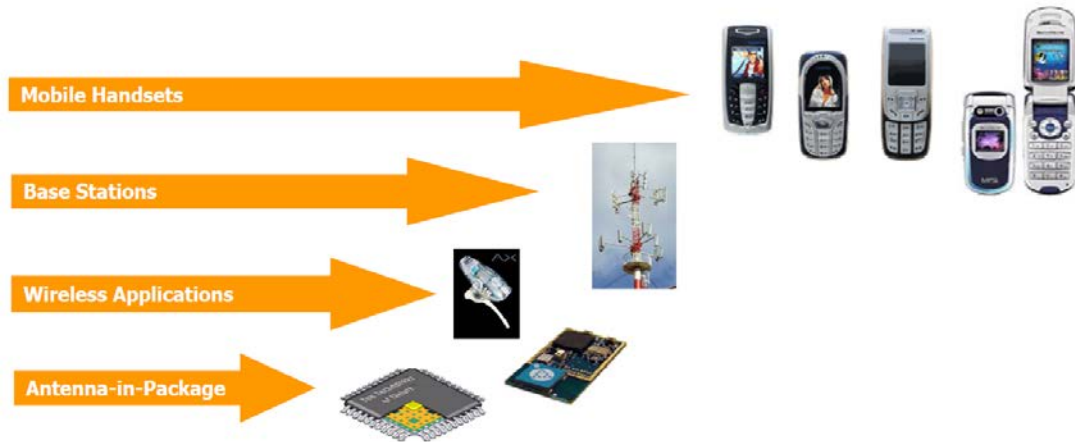
## Exhibit 4

### Final business model for Fractus



*Source: Company information*

## Exhibit 5 Fractus' product lines



Source: Company information