## 3.4 Case Study of Chile[1]

### 3.4.1 Profile of a Woman Entrepreneur

Mrs. Carmen Gloria Aracena Alvarez is an Electronic Engineer by profession; she graduated from the Chilean Federico Santa Maria University. She also holds a Postgraduate Degree on Human Resources Management awarded by the Chilean Catholic University, and coupled with another Degree on Innovation and Technology Management she obtained from the Alberto Hurtado University and an MBA from IEDE, the European University in Madrid.

Mrs. Aracena started her working life as a Telecommunications Engineer and performed a number of positions over a period of 18 years within the financial industry. Her specific performance areas were Telecommunications, Operations and Human Resources. Her senior position was as the Training Area Manager of one of the largest and leading Chilean bank.

Mrs. Aracena joined TECNOCAL in year 2001 as a full-time Business Manager while also doubling as Financial Manager. Her specific remit in year 2004 was to bolster an internal reshuffling of all processes with a view to conforming with and securing the company a certified status to the ISO 9001:2000 standards. It was in year 2010 when she became the Company's CEO. Her specific remit here was strongly advocate innovation; chiefly by means of the management of all intangible assets generated by the company.

[1] This case study was conducted by Ansonia Lillo Tor, President, University Santo Tomás, Campus Arica, Chile.

**Figure 1**. Awards for Carmen Aracena


### 3.4.2 Profile of a Company

TECNOCAL[2] Passion for Electronics Historical Background

TECNOCAL has an extensive track record endorsed by multiple products and projects undertaken on behalf of their customers as well as when it comes to developing their own products. For them, the key issue is fully gauge the design needs of their customers; chiefly by defining the scope of the problem(s) the customers wish them to sort out on their behalf. Thereafter they must suggest the sundry solution alternatives - all which are based on their experience secured after many years of company development - plus the wealth of technological *knowhow* they have access to.

This dual approach allows them to develop creative and innovative solutions that add value to their customers' business and represents a permanent challenge in their daily work endeavors. While bearing in mind that most requirements are subject to constant changes, their highly qualified professional team ensures they are kept abreast of most technology innovations and breakthroughs. When confronted with the myriad of new trends that the electronic industry is bringing to their doorstep, TECNOCAL in turn has been able to carry out significant projects, and whose every-day contribution is reflected in their steady generation of technology developments. This state of affairs gets boosted with every customer requirement. The latter, in turn, allows them to claim that they have become specialists in all matters pertaining the design, development, manufacture and integration of technology-based goods; as well as suppliers of tailor-made electronic solutions.

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TECNOCAL's setting up is based on their declared interest and passion for developing electronic technology. The company was formally set up in 1992 with its main asset at the time being the great technical capacity of its founder; particularly when it comes to electronics design and development. On the same token his aim was the development of innovative products; all intended to push further the borders of the electronic science and concepts.

During its early stages, the Company operated within the confines of a small workshop; with its main functions being associated to the supply of maintenance services to sundry machinery items owned by a number of end-user entities. In turn with the foregoing, the company kicked off with the development of engineering requirements on behalf of third parties. It is fair to say that, at this stage, the Company was lacking a precise focusing as to which industrial sectors were to be eventually aimed and tackled.

TECNOCAL has focused its experience in critical areas. Their noteworthy expertise areas are Retail, Logistics, Transportation, Traffic and Telecommunications.

The Retail Industry

One of the highest priorities within TECNOCAL is the constant generation of the widest range of innovative ideas allowing them to satisfy their customers' expectations. Due to this, their experience within the retail industry has enabled them to challenge the problems prevailing in a specific area by resorting to a different viewpoint; and chiefly aimed at the design and development of products and solutions based on cutting-edge technology. Such approach, in turn, allows them to focus their best attention at the highest market level in a timely and quality-based fashion. TECNOCAL has developed first-class products such as the "Autómata" rack, a device that caters for commercial transactions being performed at the Point of Sale (POS) indeed meet the highest operational quality ratings. The increasing advance of technology has made them pay special attention to the preferences, inclinations and needs of their customers.

The Logistics Market

TECNOCAL has focused its expertise and technical knowledge in supplying active companies in this area. With high standard quality products for generating a set of resources and methods deemed necessary and ideally suited to the specific manufacturing and distribution processes; and whose logistics is crucial for carrying out key processes when it comes to the internal management of a company. They deliver solutions which address several logistics activities, all aimed at creating optimal links between the production stage and the end-destination markets, with very specific products such as the Optical Portal for courier companies. The Optical Portal allows the operator to visualize any specific parcel dimensions while it is moving along a conveyor belt, thus supplying specific details such as the parcel's profile; even if such is irregularly- sharped.

The Transport Industry

TECNOCAL are fully aware of the significant challenges and new needs posed by the transport industry. To this end, they have taken the necessary steps for developing a range of products, which cater for innovative solutions for this specific industry. Indeed, they have been involved in each process of the *TranSantiago* project, chiefly by developing key products such as the Payment Validators, which have become a payment means fitted and used on the buses and whose BIP cards use every day. Another noteworthy item here is the Reloading Totem Pole which is a system allowing for the physical replenishing of the above "*BIP cards*".

Furthermore, TECNOCAL has participated in the design and production of solutions for the Santiago underground transport system. Here they have developed equipment items such as the Cell Equipment. These items are fitted on every underground train coach and which are capable of transmitting information from the trains onto a Centralized Command Post (PCC); thus allowing for a constant supervision of this massive transport system.

The Telecommunications Industry

TECNOCAL is interested in generating the best options and innovative services in the telecommunications area. They have developed systems such as the Data Portable Concentrators that capture and transmit all the data referred to the bus operational transactions whenever the bus enters a parking bay.

One noteworthy development for TECNOCAL has been the creation of the Drivers' Assistant kit. This device with audio messages aimed at alerting the driver that he is coming close to a restricted speed zone. This and many other significant products have positioned the company as a specialist concern when it comes to the design and development of tailor-made electronic solutions. Such achievement has allowed the company to generate a remarkable degree of trust for their product range, which, it have been developed based on high quality.

The traffic market needs, nowadays, are much more demanding than ever before. Due to this fact, TECNOCAL is undergoing a constant innovation process, mainly by implementing new product development techniques. Such approach has allowed the company to produce a range of suitable products catering for the best performance within very specific areas such as the traffic market area.

The technical specification of projects of this kind with a unique industry scope has led the customers to gain a higher degree of trust in TECNOCAL's specific capabilities. This is due to their Company's relentless energy for bringing a suitable answer to the problems experienced in very critical areas within this type of industry. Illustrations of this assertion are the Traffic cards and traffic lights, specially manufactured for their customers concerned with their product's safety, trust and efficiency ratings.


ECNOCAL is part of the Associative Committee @Internet of Things@ of the Innovation Center UC Anacleto Angelini (Santiago of Chile, August 2016)

With great commitment, TECNOCAL participated in the first session and is part of the Associative Committee *IoT* of the Innovation Center UC *Anacleto Angelini*, whose purpose is to strengthen and promote the generation of networking and business between companies associated with the Center.

Mrs. Carmen Gloria Aracena, TECNOCAL´s CEO, participated in this first meeting on June 2016. Along with the other members of the Committee; TELEFONICA, ENTEL, SONDA and

GOOGLE, whose central theme was Internet of Things in Chile, allowing -in the first instance support the generation of IoT projects and businesses in Chile with a unique platform as filed by the Innovation Center UC.

Among the activities to highlight the Committee, they can point access to a guest book where researchers, academics, entrepreneurs, customers and other relevant companies will participate, also there will be talks about *IoT* in Chile; challenges and goals, in addition to deepen the value of this opportunity pioneer in the country.

Meanwhile, Mrs. Carmen Gloria Aracena, tells her perception of this Committee, in addition to her contribution to the group.

> *"It´s important that for the first time a group of partner companies of the Center are working collaboratively, discussing about Internet of Things, which will allow in the near future to solve many problems in our country, and that for ignorance or distrust, many industrial sectors, still do not get the benefits of it."*
>
> *"Both, corporate companies, as well as the world entrepreneurship is called to resolve pains in different areas such as mining, agro-business, health, smart cities, etc., with IoT. The contribution of our company in the committee is the vision of a company that designs and develops and has HW platforms that allows capturing data from sensors and transmits them to the cloud for analysis and then process control, depending on the value of the measured variables", she concluded.*

More than 50 companies attended the Fourth Forum for Entrepreneurship and Innovation of the Pacific Alliance - LAB 4+ 2016, developed at the Jockey Club in Lima, on June 2016, where TECNOCAL had the opportunity to participate along with other buyers and exporters from Latin America. LAB 4+ 2016, organized by PROCHILE, PROCOLOMBIA, PROMÉXICO and PROMPERÚ. It was visited by more than 1500 participants and was one of the most watched programs -through streaming- during the two days of the event.

This year, the Forum had great international exhibitors who feasted on various topics pointing strongly to the "Digital Entrepreneurship", "The New Innovative Cities", "The Future in the Digital Education", and "How to deal with Innovation through the Pacific Alliance." Among the featured speakers, Mrs. Aracena found the founder of the famous Waze application, Uri Levine, who addressed issues on Large Scale Digital Entrepreneurship; plus representatives from Israel, England and Chile.


TECNOCAL participated in the IV Forum for Entrepreneurship and innovation of the Pacific Alliance / LAB 4 + 2016 (Santiago of Chile, August 2016)

During the two-day event, the CEO, Carmen Gloria Aracena, representing TECNOCAL´s company, participated in various activities such as the Workshop # 2; "Competitiveness in Innovation Centers" whose speaker was the Director of Innovation from the Coastal Bend Business Innovation Center (TAMMUC, TEXAS) - US, David Fonseca, and other panels conversation.
However, the key point of the event were the business matchmaking, where Mrs. Carmen Gloria Aracena, could meet different representatives (exporters and buyers) from countries like Peru, Colombia and Mexico, where she made herself an excellent impression, both from people who represent them, as from the event in general.

> "*Concentrate entrepreneurs and technology companies from different countries of the Pacific Alliance participate in this type of event, has great value. Since in many cases companies we can find potential partners, with complementary skills, as happened with SW companies, requiring HW developer partners such as TECNOCAL, where the IOT Box device, developed by our company, caught the attention of several companies developing WEB platforms and mobile applications, for Internet of Things*", said Mrs. Aracena.

TECNOCAL, in turn, participated actively with other national companies who demonstrated various projects, developments and innovations to the more than 250 French Chilean visitors.

TECNOCAL participated at the first ITC Digital Fair 2017 (Santiago of Chile, 2017)

The Chilean Technological Innovation ITC Digital Fair 2017 was held last May 2017 at Foundation Telefonica Building and where TECNOCAL presented a great number of innovative projects and developments, which have demonstrated over the years, the experience and solidity of this company in the development of innovative technologies.

Among the developments presented by TECNOCAL, they can highlight IoT Box, Technological platform (hardware HW and firmware FW). That will help other developers to create their own solutions in the Industrial Internet of things environment, Payment Validators, Totems, Traffic lights for public transportation, Driver Assistant for mining trucks, Tracking Mail for mail and logistics, Pre - Recorded Message System for Metro, Fiscal Control Cards, among other products. In addition, high quality productions, mainly made for industries such as; Mining, transportation, transit, retail, logistics and agriculture.

On the other hand, the fair was a great opportunity to perform matchmaking, an instance that allows meetings between companies of the sector, both to schedule and create future and possible contacts and to demonstrate and boost the projects that each company currently owns.

> "*The experience in this fair was very positive, since the alliance that Inria Chile*[3] *has with multiple actors, managed to bring together excellent exhibitors, added to a central location, allowed a greater number of people could attend the event and learn about many of the innovations which companies showed. Additionally, the meetings were very positive and with good projections*", said Mrs. Carmen Gloria Aracena, TECNOCAL´s CEO.

[3] http://inria.cl/inria-chile/

### 3.4.3 Findings

#### 3.4.3.1 Success Factors

Mrs. Aracena believes there are several important factors in her business: Passion for entrepreneurship, the Internationalize services, be aware of the trends, and networking.

Passion for Entrepreneurship
Mrs. Aracena believes that:

> *"For example, prior to the company inception, the passion for operating as an entrepreneur was already showing up when tackling the first challenge, namely the design and development of cardiorespiratory monitor suitable for the detection of the sudden infant death syndrome (SIDS).*
>
> *This development challenge encompassed a complex product that was going to become a significant milestone and point of attraction; all this while displaying the technical capabilities likely to be achieved under the "Made in Chile" development approach".*

Be Aware of the Trends
Mrs. Aracena says that:

> *"TECNOCAL made the decision to persevere and to hard work, because we wished to develop and produce electronic items in Chile, and internationalize services. The products and the services must be the high quality. That why TECNOCAL is certified in ISO 9001:2015.*
>
> *I think that I am an enterprising woman by nature; I have been actively involved in several missions and business journeys with a view to acquiring the trends and innovations prevailing throughout the United States, Asia and Europe alike".*
>
> *"Likewise, I have participated in several activities related to the local business world and the new trends prevailing throughout the technology industry. The method of managing the business is following an exhaustive analysis of the customer needs - whereby TECNOCAL has invariably developed a unique and comprehensive approach based on the highest quality standards - next step is the development and supply of the required goods or services. Professional experts in each technology area concerned undertake such a task.*
>
> *To achieve the final objective, TECNOCAL resorts to the Design Thinking methodology. The latter is specifically aimed at the development of a product or service in line with the specific requirements put forward by the customer".*

Networking

Mrs. Aracena remembered that:

> *"Five years ago, I realized that we needed to attract young engineers with new ideas to our business. Therefore, I decided to stablish networking with Santa Maria University, and I joined at 3IE International Institute for Business Innovation at Santa Maria University[4] as Mentor.*
>
> *Currently, I do mentoring (ad honorem) in 3IE only for students of Electronic Engineering[5]. I realize that this activity is a way of giving back knowledge and experience to the Society. The interaction between academia and industry must be promoted and supported. In addition, my family is a very important support. I work with my husband, who is an electronic engineer too".*

### 3.4.3.2 Challenges

Throughout her professional life, Mrs. Aracena has had to overcome a series of obstacles. Undoubtedly, this whole process has served to acquire more experience. The following section focused on the three business difficulties identified by a company that requires inserting on ICT market.

Lake of an Innovative Environment

Mrs. Aracena says that:

> *"In Chile in the last 5 years, the promotion of technological entrepreneurship has been developed more intensively. In addition, the Government Institutions, as CONICYT and CORFO, have implemented a series of contests and funds that promote the interaction and the clusters creation of technological entrepreneurs.*
>
> *Innovation has begun to be a process more widely known and recognized by the industrial sectors. It generates a work environment that facilitates the participation and development of our collaborators.*

[4] http://www.3ie.cl/

[5] http://www.3ie.cl/mentor/carmen-gloria-arace

*However, this scenario has been changing in recent years. Universities and technological incubators have played an important role with state funding, increasing and improving the technological and innovative environment*[6].

Lake of Advanced Human Capital in Technology[7,8,9,10,11,12]

Mrs. Aracena believes that:

*"Chile is not recognized as a technologically innovative country, so positioning itself abroad with products and services is more difficult. Lack of critical mass of advanced human capital in technology also affects the innovation.*

*The Ministries of Education and Economy have a leading role in the Committee of Ministers for Innovation, and their participation is channeled through the two main public institutions devoted to the development of S&T+i: the National Commission for Scientific and Technological Research (CONICYT), and the Economic Development Agency (CORFO). CONICYT, as an agency of the Ministry of Education, is responsible for promoting the formation of human capital and strengthening the country's scientific and technological base. Additionally, CORFO is in charge of increasing competitiveness of companies through innovation, entrepreneurship and technological transfer"*

Mrs. Aracena adds that:

*"The Project of 'Formation of Advanced Human Capital' was created in 1989. The main objective of this initiative is to increase the number of researchers and professionals of excellence highly skilled in all areas of knowledge, thus promoting Chile's economic and social competitiveness and its active participation in a globalized world. Through this project, CONICYT has become the main governmental agency in charge of managing postgraduate scholarships.*

*The Project currently administers calls that grant scholarships for master's and PhD studies in Chile and abroad, master's studies for education professionals in Chile and*

[6] https://cl.universianews.net/tag/incubadoras-tecnologicas/

[7] http://bibliotecadigital.academia.cl/jspui/bitstream/123456789/3505/1/TADPU%20227.pdf

[8] http://www.umag.cl/investigacion/web/wp-content/uploads/2015/05/EBitran.pdf

[9] http://www.biobiochile.cl/noticias/ciencia-y-tecnologia/ciencia/2017/08/01/mas-de-5-mil-profesionales-tech-se-necesitan-en-nuestro-pais.shtml

[10] http://www.conicyt.cl/becasconicyt/formation-of-advanced-human-capital-program/

[11] http://www.conicyt.cl/wp-content/uploads/2012/07/Brochure-Institucional-2011-Ingl%C3%A9s.pdf

[12] https://investchile.gob.cl/wp-content/uploads/2017/05/chile-a-place-to-build-your-future.pdf

*abroad, master's studies in Chile for public officers, PhD studies, medical sub-specialties abroad, doctoral research stays abroad and supplementary scholarships for PhD students of national universities".*

### 3.4.3.3 Policy Recommendations

Mrs. Aracena thinks that there are about three policy recommendations that can be deduced from this research project that could help advance to improve women position in ICT market in Chile.

Motivate the Entry of Young People into the ICT World

Mrs. Aracena says that:

> *"In Chile, there is a problem of critical mass in research groups and a lack of them in emergent IT methodologies. Attracting young and talented people to graduate studies, academia and research is the most difficult challenge. It is a priority to create funds for scholarships, including talented undergraduate students and foreign graduate students.*
>
> *Most of research is done at universities, with industry playing a minor role. It is crucial to involve industry in research. The interaction of academia and industry has to be promoted and supported. The government has to play a fundamental role by making attractive to industry to carry out, support research, and hire young scientists to develop creative activities inside their organizations."*

Create Motivating Environment for Women on the Use of ICT

Mrs. Aracena believes that:

> *"It is fundamental encourage more women to enter the field on the use of ICT by providing training and empowerment, generating the requisite knowledge and seeking opportunities for job, legal and professional betterment.*
>
> *The objective is for women to increasingly participate in technology, in increasingly relevant roles. It is especially important to encourage women to participate in this area, using as many communications tools and professional networks. When a woman is educated, she becomes a natural replicator in her immediate environment.*
>
> *Increase initiatives to do with the implementation of innovation contests opened to all audiences. The idea here is to use this initiative for encouraging the surge of novelty projects and ideas with a distinct market potential".*

Promote the Existence of Networking on ICT between Women Entrepreneurship
Mrs. Aracena says that:

> *"Empowerment can come through inspiration and through work to change the female imaginary concerning how difficult it is to incorporate women into ICT. As I do as a Mentor, other entrepreneurs can also guide those who are just starting out and show them the way. My experience shows me the importance of bellowing to a network, to an association or participate in an incubator. It is necessary to be connected with other entrepreneurships. It is remarkable that exists a very good information through the Website, in government or private Institutions, so most of the information is available and the way works for contacting them".*

### 3.4.3.4 Advise to Women Entrepreneurs

Mrs. Aracena remarks that the three followings aspects are important.

Believe in Entrepreneurship as a Process with Customers
The experience of Mrs. Aracena indicates that:

> *"TECNOCAL rates it as crucial the development of long-term relationships with our customers. To this end, we focus our entire knowledge and professionalism to fulfilling their expectations while also generating the electronic solutions that our customers need.*
>
> *It undertakes to develop value to our customers, suppliers, collaborators and shareholders in a collective way, based on trust and respect for our own and third party intellectual assets.*
>
> *I strive to achieve sustainable growth and profitability in the long term through the efficient use of our resources, based on continuous innovation and continuous improvement of our Quality Management System".*

Have a Great Passion, Commitment and Professionalism
Mrs. Aracena says:

> "*Staffed with passion for your entrepreneur and committed with the customers and the quality of solutions. I constantly challenge myself while aiming to incorporating and developing the highest technology levels".*

Be Keenly Prepared to Incorporate Worldwide Trends

Mrs. Aracena thinks that:

> "*At TECNOCAL we work looking towards the future. We firmly believe that good ideas and learning originate from the availability of good reference sources and support. This line of thinking has allowed us to become involved in several educational projects links with tertiary technical education institutions and specifically focused in areas such as Electric, Electronic and Automation Engineering disciplines*".
>
> *"To go beyond all borders and secure a good status recognition in our target markets - mainly on account of our development and the good quality standing of our technological solutions - all which are to be placed against an innovative prism background"*.

### 3.4.3.5 Summary and Discussion

In Chile, there exists a low valuation of science, research and innovation. The State should promote the diffusion of national research in various scenarios, through educational programs in schools. Additionally, they should review the programs and educational content to improve science education in Chile, and encourage the creation of libraries and laboratories at a school level. Efforts are still insufficient. Our Institutions are firmly convinced of the vital importance of having a commitment at a country level over diffusion, not only of science but also of Chilean science and the contribution of our scientists and researchers in knowledge, development, and entrepreneur of the country, and, particularly nowadays, also with a built-in gender perspective.

About Chile, it was not easy collecting sex disaggregated data on the use of ICT and women's participation in entrepreneurship. There is a lack of indicators to track the progress of women's and girl's access to the benefits of ICT.

It is important to raise the profile of women in the technology industry in Chile. Focusing on these areas: ICT; e-technologies (hardware and firmware); technologies in the fields of medicine, odontology, nutrition, ophthalmology, kinesiology, engineering, and food; biotechnology; genetic technology; technology for graphic and industrial design; greentechnologies (ecotechnologies); technologies for industry, agriculture, aquaculture, mining, construction, aeronautics, forestry, and veterinary medicine, as well as naval technology and technology support services.

It should be noted that in 2017, Chile approved the creation of Minister of Science and Technology, which is good news for the regions, out of Santiago[13].

Mrs. Aracena is a great contribution to open the vision towards the academy and the industry. It is possible to realize the lack of an organization advocating the incorporation and dynamic involvement of women in all levels of the technology business

Nonetheless, it is also remarkable to have a significant number of women entrepreneurs who are developing interesting initiatives in the design and development of technological products. Unfortunately, most projects are centralized in the Capital, in Santiago of Chile.

Finally, to promote enhancing democracy and women's participation through entrepreneurship on ICT market will mark the difference.

[13] http://www.gob.cl/2016/01/18/ministerio-de-ciencia-y-tecnologia-los-aspectos-clave-del-proyecto-de-ley/