TECHNOLOGY
WATCH REPORT

Neuromarketing for the retail sector

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TECHNOLOGY WATCH REPORT

Neuromarketing for the retail sector

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1
Overview of innovation and tendencies in Neuromarketing for the retail sector.

Before 2000, retail trade was structured on department stores, supermarkets and small shops but the arrival of E-commerce brought about a proliferation of on-line shops and applications for mobile phones. According to data from Frost & Sullivan 2018 "Evolving Smart Retail Through In-store Analytics - Improve customer experience with a data-first mindset using instore analytics technology solutions" E-commerce represented approximately 8% of all retail sales in 2015. Nowadays, it is an undeniable fact that advanced societies have integrated technology into everyday life to the point that, in the **connected generation**, mobile devices and Internet have changed ways of living, working and consuming.

Often conditioned by excellent on-line experiences, customers at physical points of sale expect **immediate, personalised service**, showing less tolerance to queuing, for example. Customers also have **high expectations for interaction** with retailers whether on-line -using social networks and mobile devices- or off-line. This context promotes the creation of new, more agile, low cost retailers, and this implies new approaches to the competition between them.

"Changes in customer behaviour, together with the introduction of new marketing channels and formats, mean that retailers must quickly adjust business models on the basis of sophisticated way of obtaining and analysing data"

In the future it seems probable that there will be a growth in **"Brick-and-Click" business models**, where retailers operate in physical shops (bricks) as well as on-line (clicks) both integrated into a **single commercial strategy**. The retail sales area will be reduced in terms of the surface area of the individual shop, but extended in the form of smaller, multiple concept shops.

This being so, presencial shopping continues to be important because it becomes the prime **point of contact** between brands and customers, but new challenges must be met to valorise these moments.
Among others things, retailers must **take better advantage of their physical shops by analysing and improving the shopping experience.**

Technology plays a key role in this context. The process of **digitalisation of a retail outlet** is usually implemented in phases leading to **digital immersion,** with the purpose of **obtaining commercial information that enables making data-based decisions.**

- One of the main reasons for retailers is to try **to understand customer needs and behaviour** by obtaining data. Information about the profiles-type of customers may be decisive for the implementation of loyalty policies. Many organisations still try to understand the behaviour of their customers through interviews and traditional research processes which, if not implemented correctly, do not reveal the customer behaviour. But the use of sensors and visual analysis can help simplify and automate

this research. Taking advantage of large amounts data collected by cameras, for example, enables retailers to better understand purchase patterns, preferences, demographic diversity and many other aspects.

- As the digitalisation of retail trade advances, **omni-channel experiences** become more sophisticated. On-line interactions are optimised to direct traffic towards physical shops, areas when interactions are again intensified to understand customers, and then deduce guidelines for **shop design** and changes in **product ranges.** Some companies still suffer from imprecise inventories because of inaccurate predictions and ineffective promotions, but organisations are moving towards the deployment of integrated transparent models for all channels of the retail supply chain. Automation software available through cloud computing plays a fundamental role in this process of transformation, as it eliminates the need for manually processing orders in a single place and also helps provide all agents involved with a transparent view of the order status, from anywhere at all.
- Bringing **digital content to a retail outlet** and force interactivity, often with **Internet of Things** (IoT) with the idea of creating a **stronger and more interactive customer experience**, is also a growing tendency seeking to positively influence customer spending and brand loyalty. As **involving customers with the brand** is one of the most difficult tasks in a competitive commercial space, retailers adopt innovations and take advantage of technological convergence to stay close to customers and inform them about products and services, **guiding their decision-making processes** however they like.

Changes in customer behaviour, together with the introduction of new marketing channels and formats, mean that retailers must quickly adjust business models on the basis of sophisticated way of obtaining and analysing data. In short, the growing use of useful technologies to automate operative processes, improve marketing processes to free-up more specific content and improve customer communication with points of sale. Some of the technologies providing next generation services to commercial spaces are **IoT sensors**, **cloud computing**, **augmented reality** (AR), **artificial intelligence** and **digital payment systems**.

But in the near future retailers will not only invest in platforms, but also in **customer analysis methods and models.** Sensors in shops, together with analytics, provide the power to follow-up consumers to the physical plane, but to do so outlets must progress towards **"scientific mentalities" for the collection, analysis and strict modelling of data**. In this context, the idea of neuromarketing comes to the fore.

It is well-known that specialists in psychology and neurosciences coincide in saying that purchase decisions are not only of the rational type, but also include strong instinctive and emotional components. In fact, it has been shown that the majority of decisions are made **unconsciously**. Neuromarketing offers a **scientific basis** for **analysing** consumer **demands** and **perceptions,** and for detecting and interpreting their **needs**, **hopes**, **desires**, **frustrations** and **projections**. This science is even used to predict **behaviour patterns** leading to suggesting the most suitable products, channels, messages and prices. In retail, the analytical elements of neuromarketing may include:

- **multisensory experiences**: odour, music, colours, light and comfort of spaces (points of sale, shop windows and facades).
- customer **movements**.
- seller **behaviour**.
- **product** positioning.
- the **experiences** being suggested: possibilities of interaction, induced entertainment.

Improve marketing efficiency based on **neuroscience** implies, among other things, applying **Brain Computer Interface** (BCI) techniques involving the capture and understanding of human brain waves, the electrical signals generated by the brain. The analysis of these signals enables deciphering various parameters such as attention or **concentration levels, thought focus and emotional activity.** These signals, now widely used in the healthcare sector and consumer electronics, can also be used in several types of neuromarketing devices.

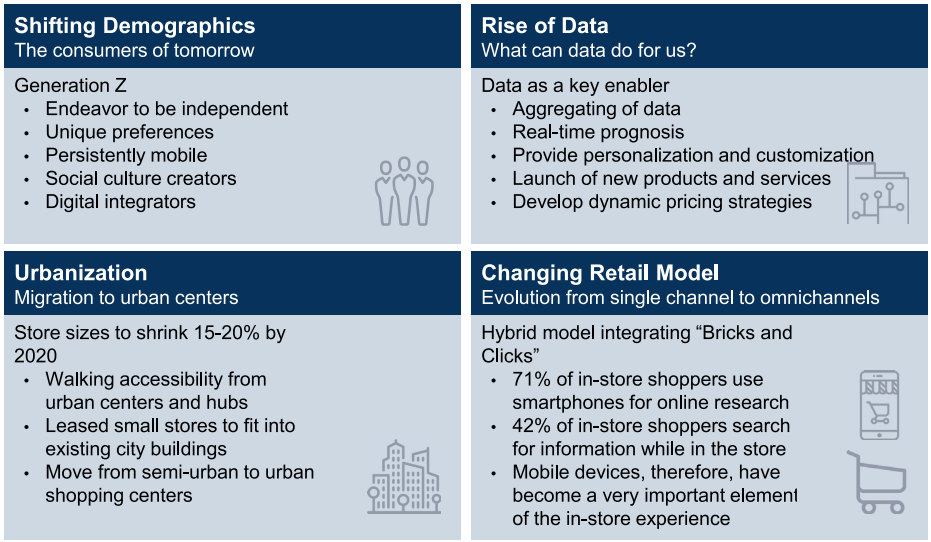
It is also interesting to note the use of **Functional Magnetic Resonance Imaging** (FMRI) techniques based on **neuroimaging** procedures that measure brain activity through analysis of the changes in blood flow in the brain detected by magnetic resonance. A common FMRI image may represent one region of the brain with more blood flow than another, indicating use levels different brain areas. Investigations in neuromarketing consider the measurement of **blood flow in the areas of brain** responsible for **decision-making processes** in individuals, as well as **electroencephalograms** (EEG) that track brain activity through electrodes strategically placed on the head. The combination of FMRI and EEG is used to study brain activity by measuring the blood flow to regions of the brain that are active during exercises such as when purchasing on-line or watching advertisements for new products. Other applied research and innovations contributing to neuromarketing include the use Neurofocus, Neuroconsult, Neuro-insight and EmSense neuromarketing services.

The application of neuroscientific methods to marketing is a relatively new field of research, undoubtedly interesting in marketing research not only for the **new results** it contributes about the **consumer sub-conscious**, but also because it helps reject unpromising hypotheses or, in other words, **it identifies lines of research which delve more deeply into more traditional methods**, as well as the application of the Smart Retail technologies described above.

Companies such as "Nielson Market Research" are already using neuromarketing to evaluate sensorial experiences, the propensity to certain products and the emotional commitment of buyers for their client companies. In the near future **multidisciplinary experts** will work together to evaluate and design hypotheses about the impact of the nervous system on the **purchasing experience.** Among brands, neuromarketing will become **a way of differentiation** in the measure that it contributes to providing additional income flow.

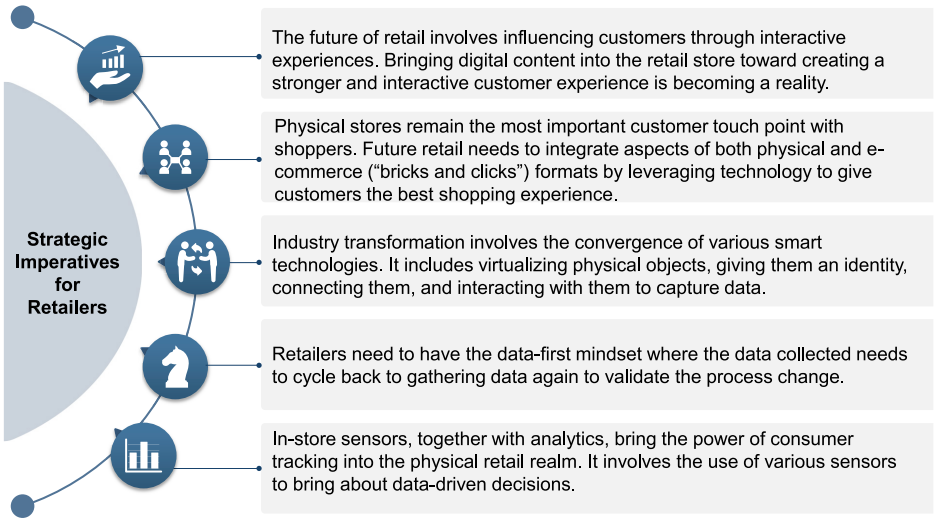
2
Smart Retail, Sensory Tracking and Brain Computer Interface: Key infographics

2.1. Changes in consumer patterns and effects on Retail and Consumers



Source: Frost & Sullivan (2018). Evolving Smart Retail Through In-store Analytics

2.2. Strategic imperatives for retailers



Source: Frost & Sullivan (2018). Evolving Smart Retail Through In-store Analytics.

2.3. Areas of digital transformation in retail trade.

Source: Frost & Sullivan (2017). Digital Transformation in the Global Retail Sector.

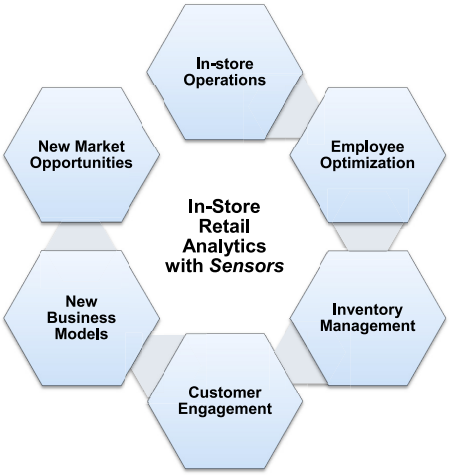
2.4. Impact of digital transformation by geographical areas.

Trend	APAC	CEE/CIS	LATAM	North America	Western Europe
Perfect Personalisation	◑	◑	◔	●	◑
Mobile and Ambient Commerce	◑	◕	◔	●	◕
Immersive Experiences	◑	◑	◔	●	◕
Non-human Agents	◑	◑	◔	●	◕

Low ○ ◔ ◑ ◕ ● High

Source: Frost & Sullivan (2017). Digital Transformation in the Global Retail Sector

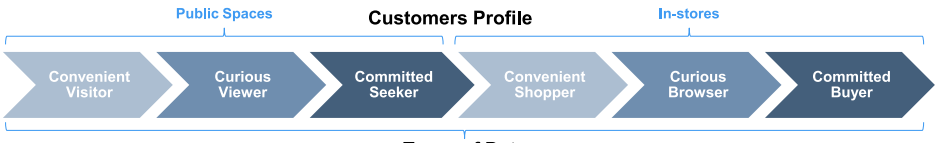
2.5. Smart Retail: Value of data capture



Category	Retailers Value
In-store Operations: Management of facilities and human traffic Optimization of product display	Monitoring, localization, control & safety
***Employee Optimization*:** Monitoring of employees	Functionality, availability of staff and cost
***Inventory Management*:** Optimization of inventory	Product availability, managing inventory cost
Customers Engagement: Understanding customer behaviors and what drives buying patterns	Customer retention, customer satisfaction, lead generation, offer optimization, sales proposition, customer experience
New Market Opportunities: Data as a product	Sharing of intelligence with the ecosystem
New Business Models: Managing of online and offline experience	Added-value offering / new services, Pay-per-use / Product-as-a-service

Source: Frost & Sullivan (2018). Evolving Smart Retail Through In-store Analytics

2.6. Smart Retail: Consumer profiles and data dimensions



Types of Data

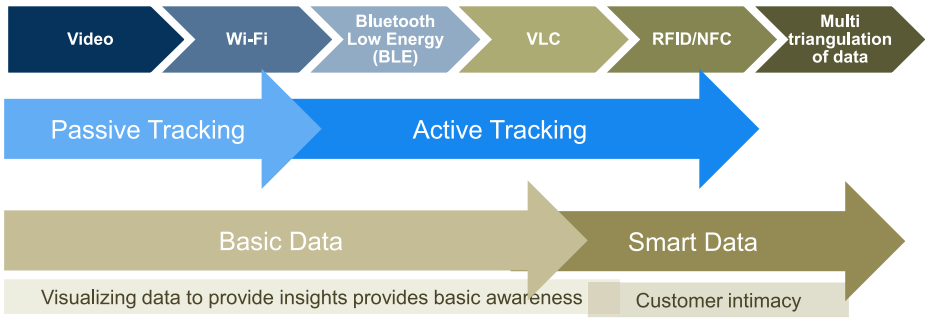
	Environment	Duration	Profile
Physical Parameters	• Footfall • Direction • Entrances and exits • Transit	• Dwell (how long customers interact) • Time of day • Peak days	• Age range • Gender

Data Outcomes

	Environment	Duration	Profile
Behavioral Tendencies	• Traffic patterns • Hot spots, cold zones • Understand pathing • Quantify concepts and brands for optimization	• Measure interactivity • Quantify marketing activities • Optimize staffing	• Customer profile • Cater to customer needs • Focus on concepts and activities

Source: Frost & Sullivan (2018). Evolving Smart Retail Through In-store Analytics.

2.7. Smart Retail: Data compilation technology.

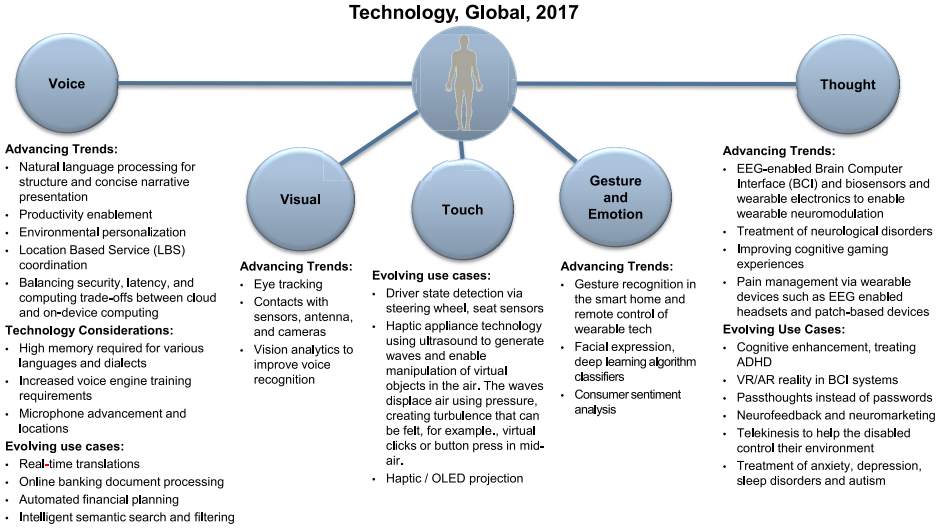


Source: Frost & Sullivan (2018). Evolving Smart Retail Through In-store Analytics

2.8. Sensory tracking: Technological tendencies and coincidences.

Voice, visual, touch, gesture/ emotion, and thought sensory advances will have notable impacts, particularly with biometrics, payments, and wearables

Wearable Technology in Energy: Advances in Trends, Technology, and Use Cases in Sensory Technology, Global, 2017

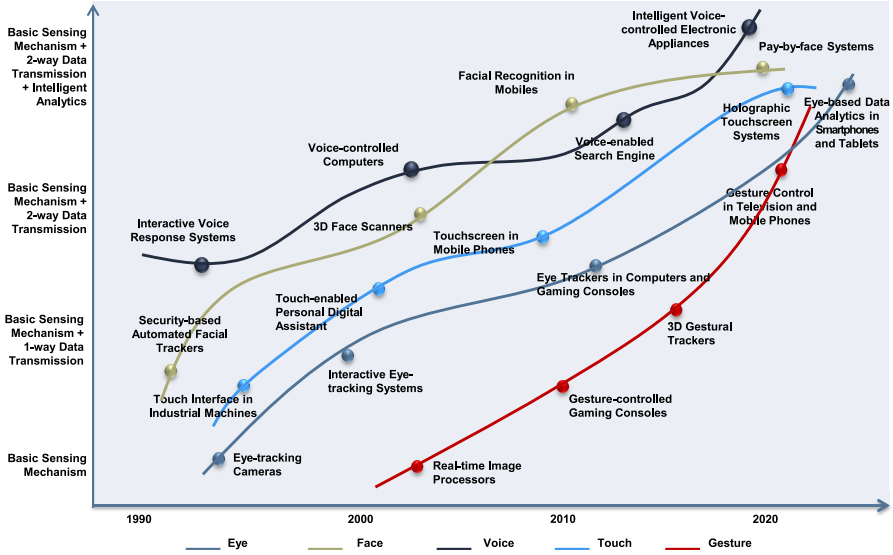


Source: Frost & Sullivan (2018). Impact of Wearable Technology on the Global Energy Sector, 2017

2.9. Sensory tracking: Technological development

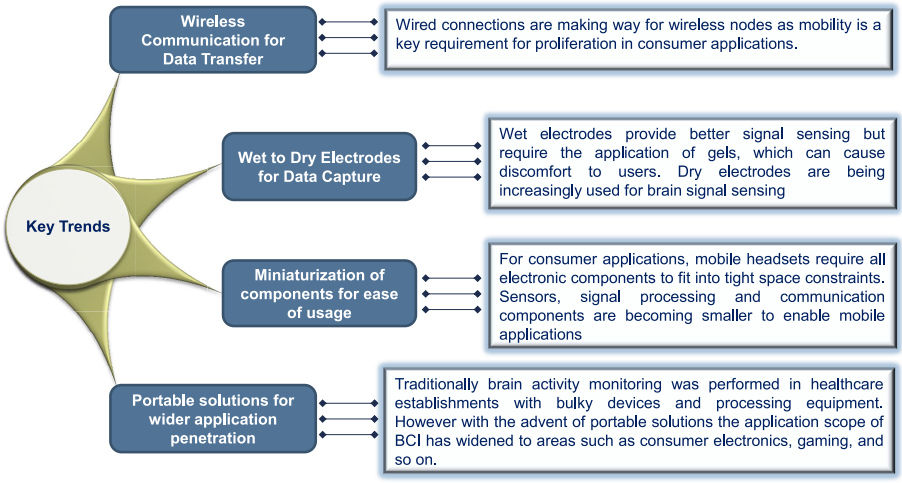
Interactions with technology will increasingly span and blend multiple sensory inputs. Connectivity and convenience are driving the evolution of sensory technology.

Wearable Technology in Energy: Evolution of Sensory Tracking Technology, Global, 1990–2020



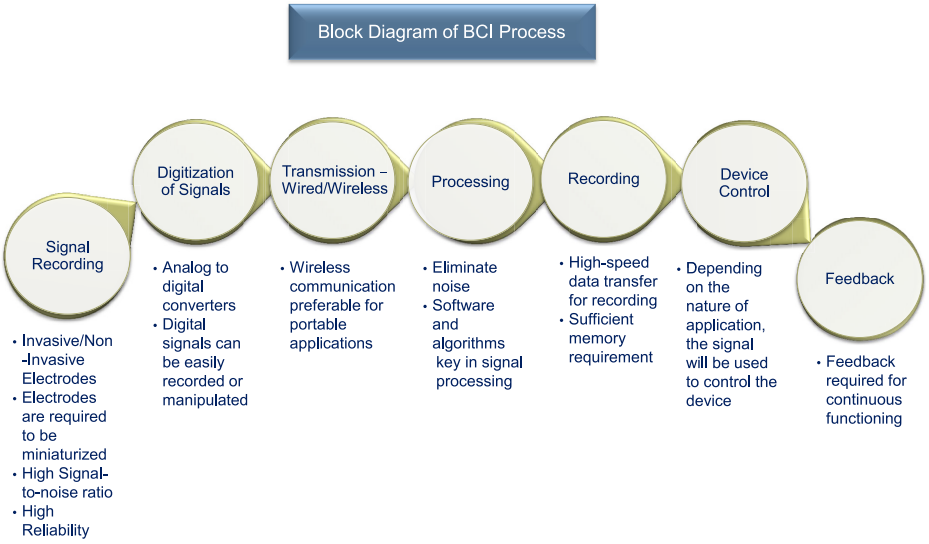
Source: Frost & Sullivan (2018). Impact of Wearable Technology on the Global Energy Sector, 2017

2.10. Brain Computer Interface (BCI): Key tendencies



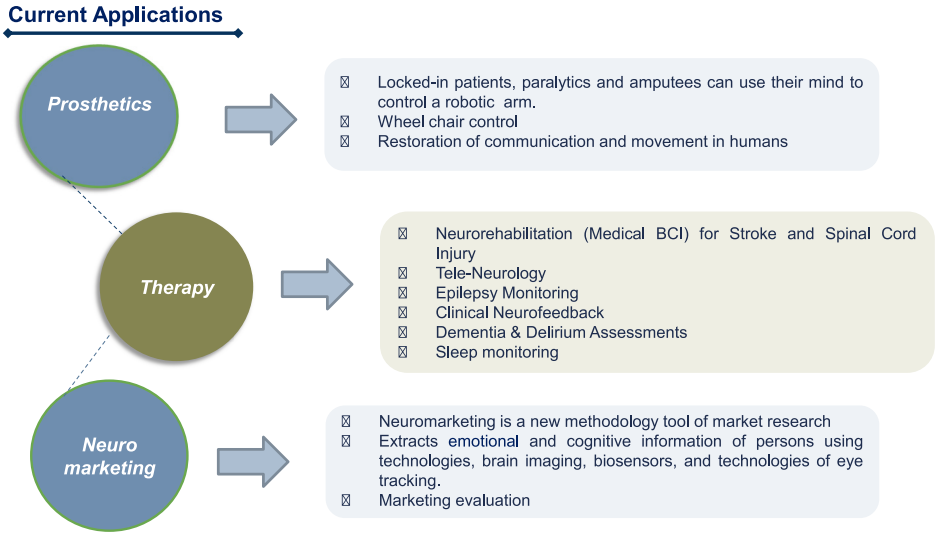
Source: Frost & Sullivan (2014). Radical Innovations Based on Brain Computer Interface(BCI) (Technical Insights)

2.11. BCI: Functional aspects



Source: Frost & Sullivan (2014). Radical Innovations Based on Brain Computer Interface(BCI) (Technical Insights)

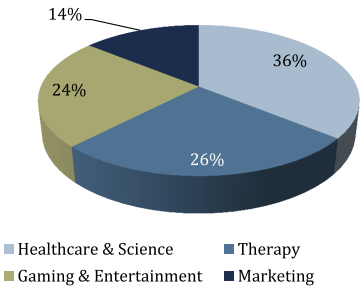
2.12. BCI: Applications



Source: Frost & Sullivan (2014). Radical Innovations Based on Brain Computer Interface(BCI) (Technical Insights)

2.13. BCI: Potential market

Market Overview – Market Size and Market Share

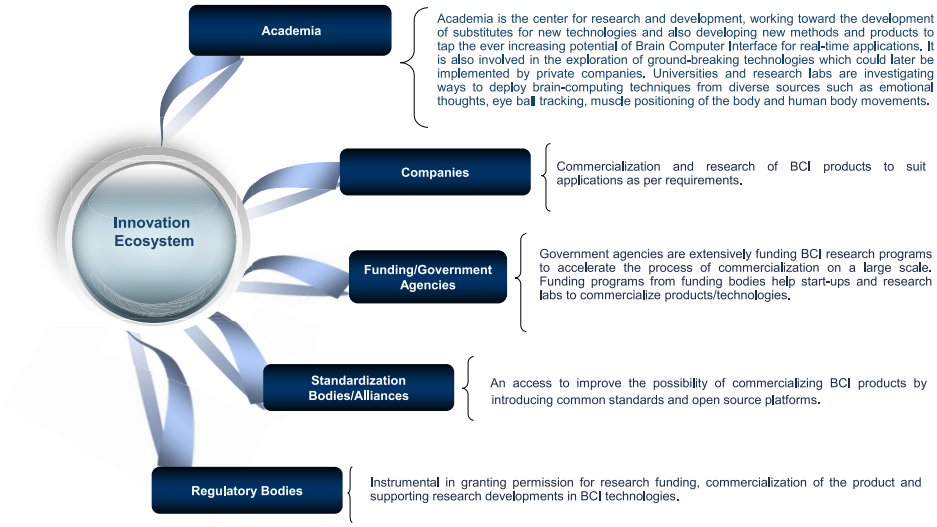


BCI Market Size by Segment (in million USD); Global, 2013

Healthcare & Science	38
Therapy	28
Gaming & Entertainment	25
Marketing	15
Others	10
Total	**116**

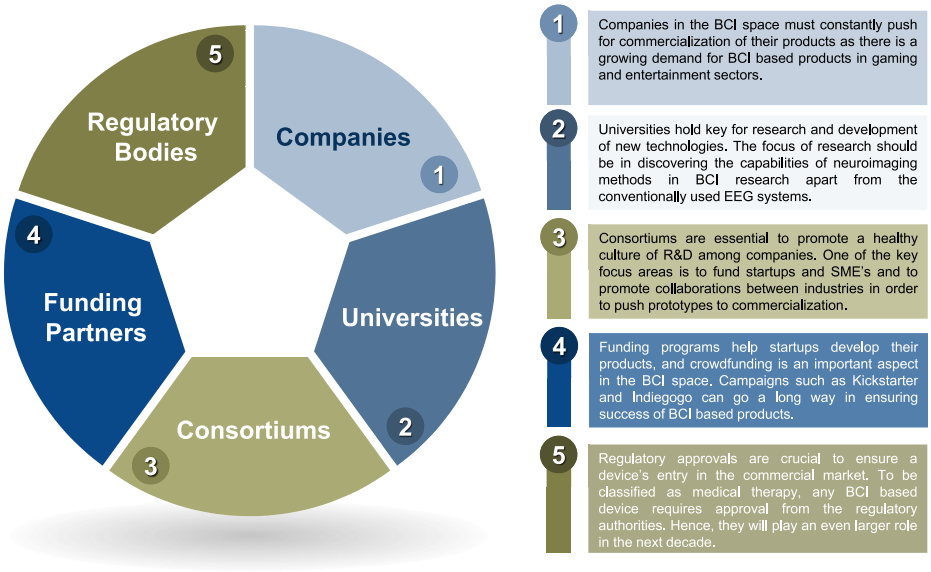
Source: Frost & Sullivan (2014). Radical Innovations Based on Brain Computer Interface(BCI) (Technical Insights)

2.14. Innovative Ecosystem of BCI



Source: Frost & Sullivan (2014). Radical Innovations Based on Brain Computer Interface(BCI) (Technical Insights)

2.15. Agents of innovation in BCI



Source: Frost & Sullivan (2016). Brain Computer Interface (BCI) Opportunities (TechVision)

2.16. Global developers of BCI technologies

North America

- Brown University
- Tufts University
- Georgia Institute of Technology
- University of Florida
- University of Washington
- John Hopkins University
- Purdue University
- Harvard University
- Duke University
- Interaxon
- PLX Devices
- Archinoetics
- Neuromatters
- Neurovigil
- BrainMaster Technologies

Europe

- Oxford University
- Fraunhofer Institute for Computer Architecture and Software Technology, FIRST
- IMEC
- CorTec GmbH
- Southampton University
- University of Essex
- Twente University
- TU Graz
- Mega Electronics
- Glasgow University
- Starlab
- Swiss Federal Institute of Technology
- BitBrain Technologies
- TU Berlin

APAC

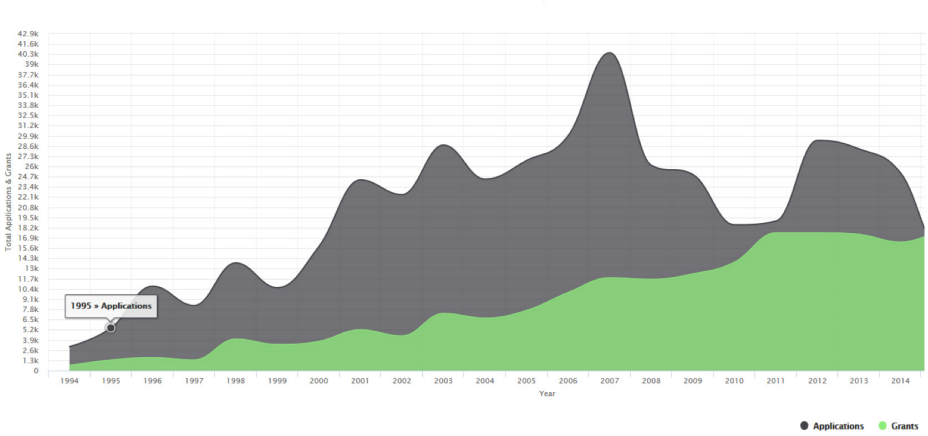
- University of Sydney
- Tsinghua University
- Tomita and Ushiba Laboratory
- Riken Brain Science Institute
- Nanyang Technological University
- Korean University
- Samsung Electronics Co

Source: Frost & Sullivan (2014). Radical Innovations Based on Brain Computer Interface(BCI) (Technical Insights)

3
Patent analysis

3.1. Evolution of patents applied for and granted

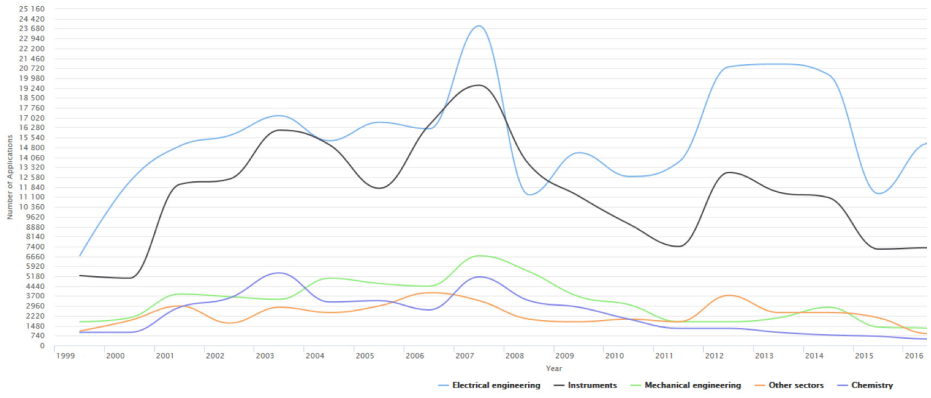
An analysis of the patents applied for and granted over that last few decades reveals the growing tendency. On average in this area of knowledge, 53.3% of patents applied for are granted.



Source: PatBase. Query: October 2018

3.2 Technological sector of the patents applied for

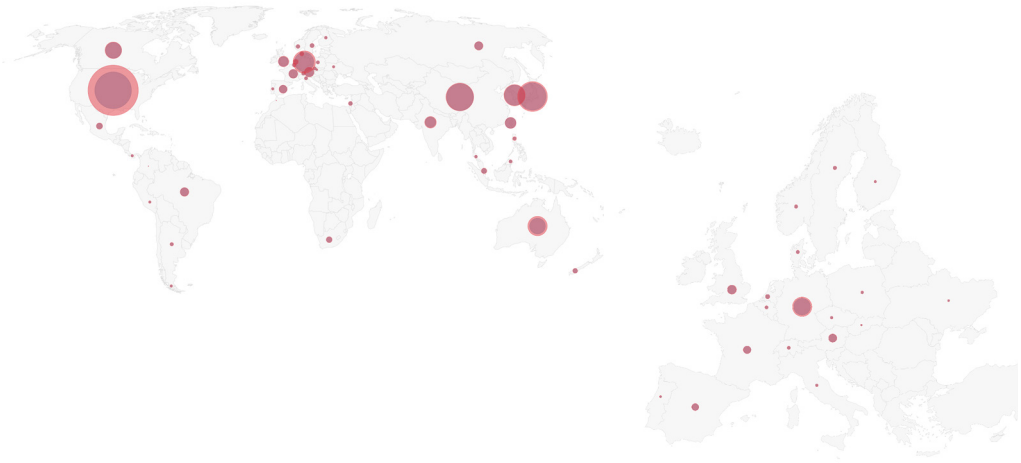
The technologies most associated with the patents applied for in the field of neuromarketing belong to the following fields: electronic engineering, instrumental engineering, mechanical engineering, chemistry and other sectors.



Source: PatBase. Query: October 2018

3.3. Territorial location of patents: Europe is the leading continent in patents granted

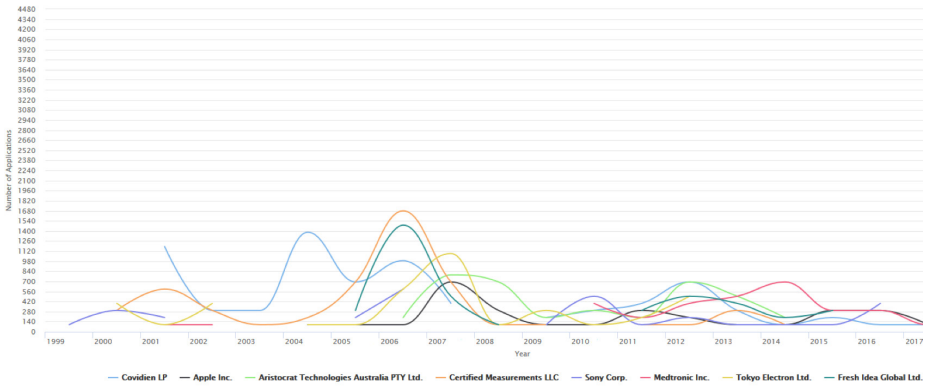
United States is the continent with most patent applications in the world, followed by Japan, China and Europe. China and India are hubs where the greatest increases are expected over the next few years. In Europe, the countries where most patents are applied for are Germany, the United Kingdom and Austria.



Source: PatBase. Query: October 2018

3.4. Most active patent applicants over the last 20 years

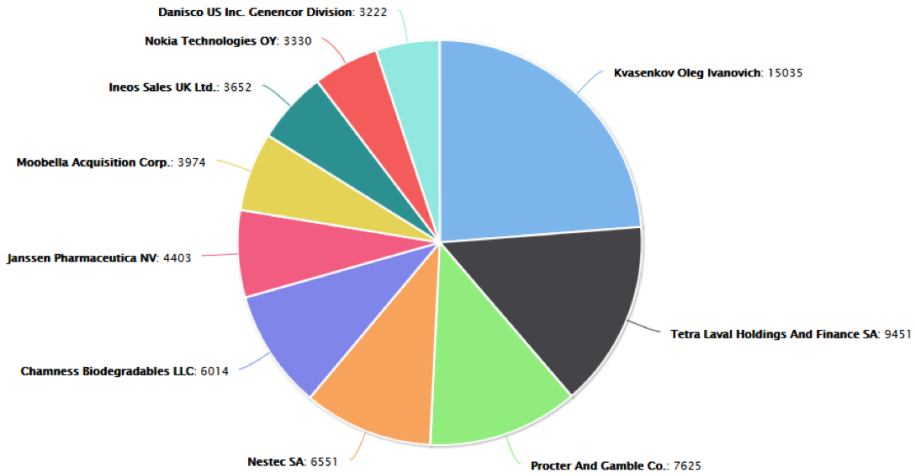
The graph below shows the eight most active applicant organisations over the last 20 years, as well as the periods in which these applications were concentrated. Applications year by year.



Source: PatBase. Query: October 2018

3.5. The 10 most active applicants

The ten most active bodies (companies, institutions or people) filing patent applications, including the number of applications for each one are shown below.



Source: PatBase. Query: October 2018

3.6. Keyword analysis

The main keywords associated with patent applications in the field of study are: control, computer screen, signal, parameters, data entry and information systems. In all cases the terms are related to systems for processing and analysing data from the brain or on behaviour, for use in the area of marketing.

Source: PatBase. Query: October 2018

3.7. METHODOLOGICAL APPENDIX

The data provided in the "Patent analysis" section refers to a study carried out on a sample of 504,998 patent applications in the field of new neuromarketing solutions for retailers (Emerging Brain-computer interface technologies for neuromarketing applications), and focussed on world-wide activity over the last twenty years, with greater emphasis on Europe.

147,106	**88,659**	**504,998**	**705,022**
Patent family	Family of patents granted	Applications	Publications
Total number of families in this set of results	Total number of families with publications granted with this set of results	Applications with this result	Publications within this result

Source: PatBase. Query: June 2018.

The field of knowledge related to neuromarketing for retailers is multidisciplinary and transversal, subdividable into more specific sub-fields. The field of new technologies of so-called "Brain-Computer Interface Technologies" is vast, but when classified in relation to their use in neuromarketing, the number of technologies drops significantly.

Patent documents are classified in different international classification systems to simplify searches, the most often used being the International Patent Classification (IPC). Pursuant to this nomenclature, obtaining the sample for this report considered the inclusion, among others, of the following indexes:

- G06Q30/02: Computers. Marketing, e.g. market research and analysis, surveying, promotions, advertising, buyer profiling, customer management or rewards; Price estimation or determination.
- A61H2230/00: Physical therapy apparatus, e.g. devices for locating or stimulating reflex points in the body; artificial respiration; massage; bathing devices for special therapeutic or hygienic purposes or specific parts of the body. Measuring physical parameters of the user.
- G06F19/00 : Digital computing or data processing equipment or methods, specially adapted for specific Applications.
- G06T2207/00: Indexing scheme for image analysis or image enhancement
- G06T7/00: Image analysis.

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