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Behavioural economics in telecoms: an
analysis from a Vodafone store's sales



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Abstract

Telecommunication is a unique good because it is characterized by an oligopoly, a low degree of differentiation, collusion among brands and high complexity of the supply. Therefore, consumers are affected by several biases leading to inefficient choices. The leading incumbent exploits such inefficiency. Behavioural economics applied to telecoms services has been addressed, in particular concerning *incumbent bias* when consumers decide whether to switch broadband provider. The study aims at providing the scientific community with additional determinants of consumer behaviour on switching among a multitude of factors.

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Introduction

The thesis addresses behavioural economics applied to telecommunication services. Indeed, telecom services are unique because of multiple factors, such as technological complexity, high concentration and cognitive biases of the consumers.

Telecommunication sector is made of companies that make it possible for people to communicate, receive and send information in several ways, namely through phone, Internet, airwaves, cables, wires, wireless and so on. Such firms created infrastructures that enable the sending of words, voice, audio, video anywhere across the world. Some firms are focused on one level of the overall value chain, while more firms are vertically integrated competing in creating infrastructures, in selling services, in innovating, and so on. However, the industry is made of three sub-sectors, namely telecom equipment, telecom services and wireless communication.

Before the 2000s almost everywhere in the world telecommunications were controlled by national and regional operators in monopoly markets, usually as State-owned companies. The first attempt to move the sector from a monopoly of the State to a competition market was in the US when in 1982 AT&T was broken up in seven firms, beginning a revolution that has shaken telecommunications in all countries. Indeed, at the end of the 20th century, the sector was characterised by deregulations, privatisations, liberalisations and many innovations. However, many ex-monopolist operators are still the leading players in the competition, benefiting from historical brand equity. Although competition has increased innovation rate, by continuously bringing new products and services in the market, the incumbent can bias consumer behaviour and alter competition given its privileged position. The thesis aims at providing new insights on such issue.

The first section addresses an overview of telecommunication industry through a description of mobile and broadband markets, a brief analysis of the competition among Italian brands, main industry trends (5G and IoT), and main regulation and policy measures from liberalisation until present days. The second section addresses behavioural economics by describing main theories, such as bounded rationality, *System 1* and *System 2* of human thinking, prospect theory. Additionally, main cognitive biases affecting people's mind are listed as well as behavioural insights from the scientific community related to behavioural economics interventions. The third section addresses behavioural economics applied to telecom services, by presenting cognitive biases affecting telco's customers; then it describes main papers investigating switching behaviour issue concerning broadband services; finally, main findings from an analysis of a Vodafone store's sales aiming at investigating *incumbent bias* are presented. The fourth section

presents *OECD's BASIC* toolkit, which suggests how behaviourally-informed interventions should be designed and applied to succeed. Three out of five steps are implemented, whose outcome is two intervention strategy, the first by using gamification theory and the second by the exploitation of social comparison with peers that nudges human behaviour.

Chapter 1

The Italian telecommunication industry

1.1 Broadband market

Internet service providers are suppliers that offer their customers access to their infrastructure to use Internet services. The broadband market is characterized by different technologies with a relative quality level of the service (see Figure 1.1):

- **Copper (ADSL):** ADSL stands for "Asymmetric Digital Subscriber Line" and it refers to internet connections where data are received and transmitted at different speeds. It is called asymmetric because, usually, download speed is higher than transmission speed. It uses copper cables, and it can reach 20 Mbps at most when downloading but only at optimal performances;
- **Fixed wireless access (FWA):** it is fixed broadband access made available through a wireless connection, that uses fixed-wireless antenna technologies;
- **Fiber to the cabinet (FTTC):** it is the denomination of one of the network architectures using optical fiber; in such case, optical fiber connects transmission plant to cabinet located in the streets of the city; instead, cables from the cabinet to customer's building are made in copper. Its performances reach 200 Mbps in download at most;
- **Fiber to the home (FTTH):** it is the network entirely using optical fiber, even in the tract from the cabinet to the building; it is the most reliable and performing technology because it allows users to reach 1 Gbps and minimum latencies.

In Italy in 2019, there were around 19.6 million broadband lines. Copper remains the first technology available in the overall broadband network, representing almost 50% of it in Sept 2019. However, there is a significant trend in act seeing copper percentage dropping at a fast pace (-23.1% compared to the previous year) in favour of other technologies, optical fiber technologies in

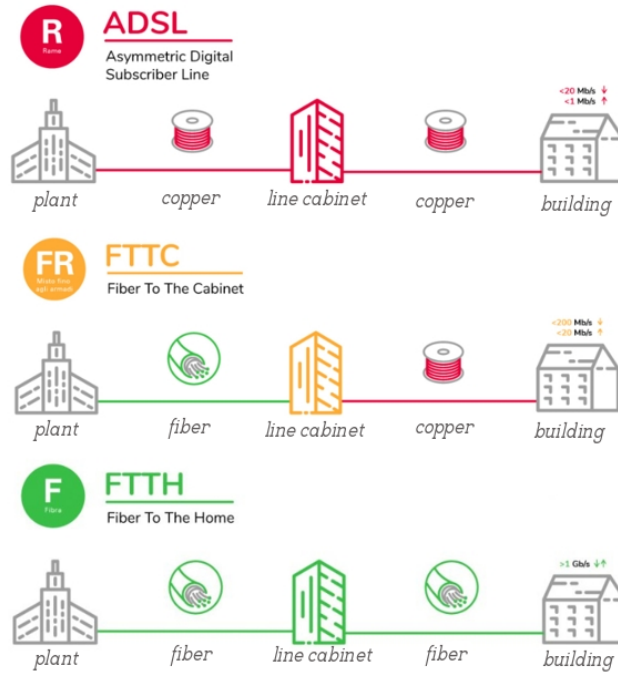


Figure 1.1: Broadband technologies

particular (i.e., +29.2% for FTTC connections and + 46.1% for FTTH connections). This trend is mainly due to huge investments made by OpenFiber, which aims at reducing the digital gap among citizens by "connecting Italy 1 GB at a time" (see Figure 1.2). Even though overall lines are decreasing with a CAGR equal to -0.84% in terms of quantities, the market is moving forward thanks to technological innovation; indeed, FTTC and FTTH connections represent almost 44% of overall lines, respectively 7.48 and 1.14 million lines.

It should be considered that the average consumer seems to be willing to pay additional 5€ to use the optical fiber connection instead of the copper one. Such amount is not a high increase in consumer demand (at least not as high as firms would have liked); thus, it is necessary to aggregate investments and not duplicate them, just like OpenFiber is trying to do.

Innovation technology allowed average connection speed to increase consistently (see Figure 1.3). Indeed, while in Sept 2015 almost 70% of the population was connected at speed slower than 10 Mbps, today it is just 21.1%, with a sizable CAGR of more than 25%. However, its fall is decreasing, meaning that the bulk of copper connections has been substituted with a faster connection. Conversely, while in 2015 only 1.4% of connections could use a speed higher than 100 Mbps, today, around 37.4% of connections can benefit from it. Besides, connection speed ranging between 30 and 100 Mbps is equal to 15.6% of connections. Therefore, connections with a speed higher than 30 Mbps (considered the threshold speed deemed as a change from old slow connections) represent more than half of overall connections (i.e., 53.1%), meaning 2.70 millions of connections for 30-100 Mbps range and 6.52 millions of connections for a speed higher than 100 Mbps.

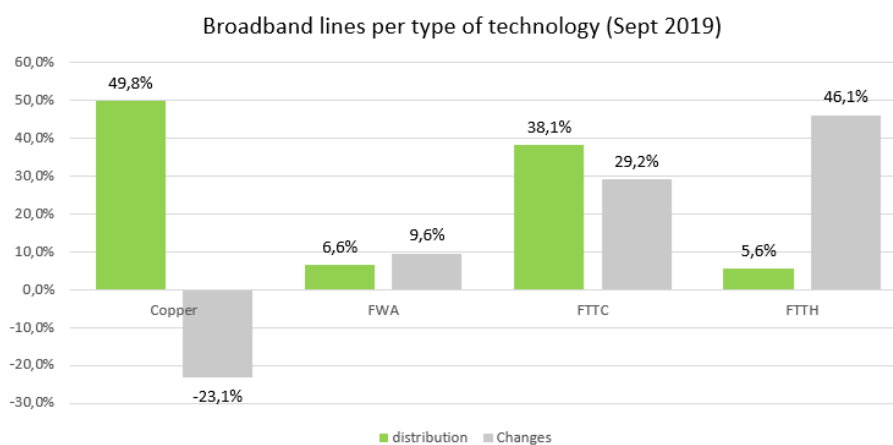


Figure 1.2: Source: AGCOM observational study

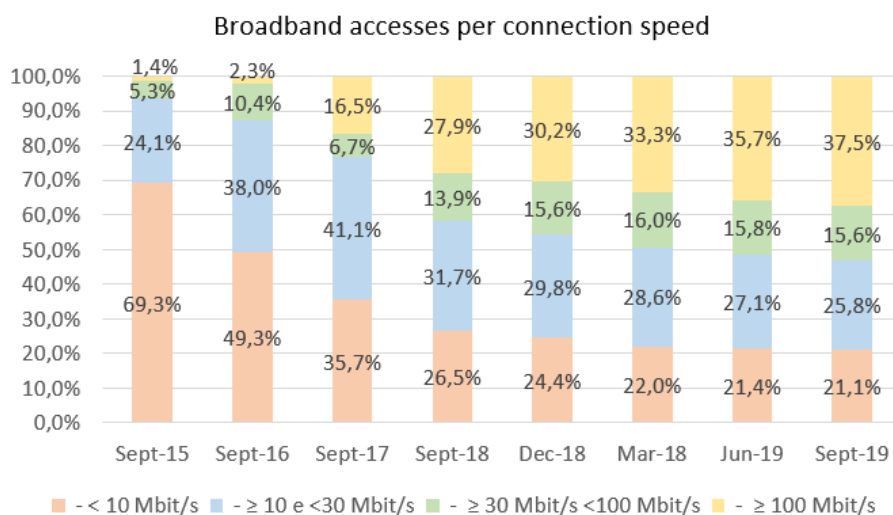


Figure 1.3: Source: AGCOM observational study

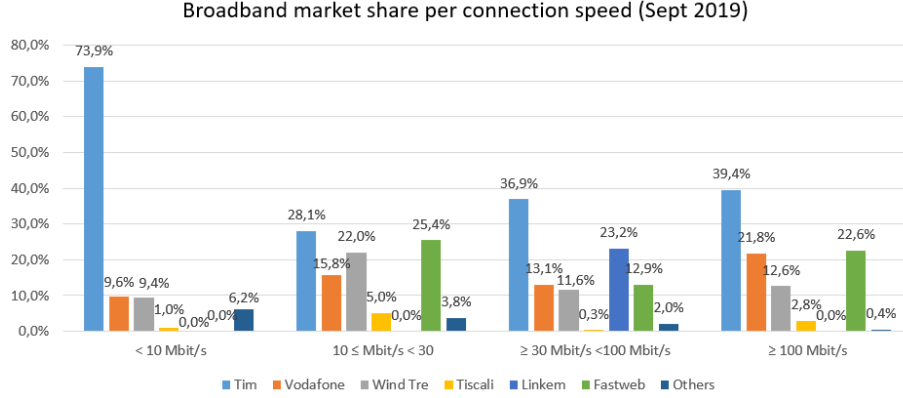


Figure 1.4: Source: AGCOM observational study

Unsurprisingly, the primary incumbent in such a market is Tim (also Telecom), which has around 47.4% of market share, almost half of the market. However, there are some differences per type of connection. *AGCOM* shows market share per connection speed, which is strictly correlated to the type of technology used by the consumer (see Figure 1.4). Notably, Tim's market share is equal to 73.9% where speed is below 10 Mbps, meaning that there is no substantial competition outside big cities, while it still has a high relative market share in other segments of the broadband market, namely 28.1% for speed ranging 10-30 Mbps, 36.9% for speed ranging 30-100 Mbps and 39.4% for speed higher than 100 Mbps. In the slow speed segment Tim reigns and only Vodafone and Infostrada (also Wind-3) compete both with 10% of market share. Instead, when speed increases Fastweb strongly competes, reaching the second position in two of the three segments where speed is high. To be noted that Linkem gets the second position only in 30-100 Mbps segment, with a respectable 23.2%, while it does not compete in other segments, probably because of intrinsic limits of its technology; indeed, Linkem uses a different technology, that is broadband in wireless mode (i.e., LTE, WiMax, Hyperlan e Wi-Fi). Instead, Tiscali and other firms play a marginal role in broadband competition.

Hence, the broadband market may be considered as highly concentrated. *Herfindahl–Hirschman Index* (HHI) has been used to measure market concentration both in the overall market and single segments (where s stands for the market share of i -th firm).

$$HHI = \sum_{i=1}^N s_i^2 \quad (1.1)$$

To be noted that:

- HHI lower than 100 means a highly competitive market;
- HHI between 100 and 1,500 means an unconcentrated market;
- HHI between 1,500 and 2,500 means a moderately concentrated market;
- HHI higher than 2,500 means a highly concentrated market.

HHIs are shown in the following table:

Market	HHI
Overall	2,891
< 10 Mbps	5,682
10 < Mbps < 30	2,208
30 < Mbps < 100	2,379
> 100 Mbps	2,705

Hence, extreme segments are highly concentrated, while intermediate segments are concentrated. Regardless, the overall broadband market is highly concentrated, despite 20 years of liberalization.

1.2 Mobile market

In Italy in 2019, there were around 104.1 million mobile lines, with a CAGR equal to 1.79%. The mobile market is still concentrated, but it has been recently shaken by a new entrant (i.e., Iliad), a French operator that decided to enter the Italian mobile market with aggressive prices. Such a pricing strategy has caused a price war among the leading firms, which had to undercut their prices to contrast Iliad's entry into the market. However, it appears that the market has adjusted to such entry.

Looking at the overall mobile market, Tim still maintains the first position in the competition (with a market share equal to 30%), but Vodafone and Wind-3 are very close, respectively with a market share of 28.8% and 28.1%. Notably, despite its recent entry in the market, Iliad has already reached 4.4% of market share, mostly damaging Wind-3, which was the first mobile brand a few years ago. This is because Wind and 3 capture more price-sensitive consumers that are more willing to switch to a provider (i.e., Iliad) offering "shocking" prices.

Several Mobile Virtual Network Operator (MVNO) entered the market: they don't own mobile networks; therefore, they use incumbents' networks, paying them a royalty for its usage. Notwithstanding many MVNOs are now available in the market, offering very aggressive and competitive tariffs, they still get only 4.6% of market share (if not considering Iliad's 4.4%). Indeed, even though the mobile connection is perceived as a commodity by now by the consumer, meaning higher price sensitivity, incumbents still own 86.9% of the overall market. However, it is interesting to look at differences in the market share when dealing with different classifications. Figure 1.5 shows the brands' market share in the mobile market per type of subscription. Indeed, mobile subscriptions may be classified as human vs M2M, residential vs business, prepaid vs postpaid.

Only-human subscriptions refers to "only-voice", "voice and data" or "only-data" sim cards; but all of them have to be managed by users. They differ from *Machine to Machine* (M2M) subscriptions, which, on the contrary, allow equipment, even using different technologies, to be connected and to exchange incoming and outgoing data that equipment gathered and processed. Therefore, human intervention is not required. Looking at market shares, in only-human subscriptions Wind-3 is the leading brand, getting 30.7%, whereas Vodafone suffers a bit more compared to the other two main incumbents. However, either

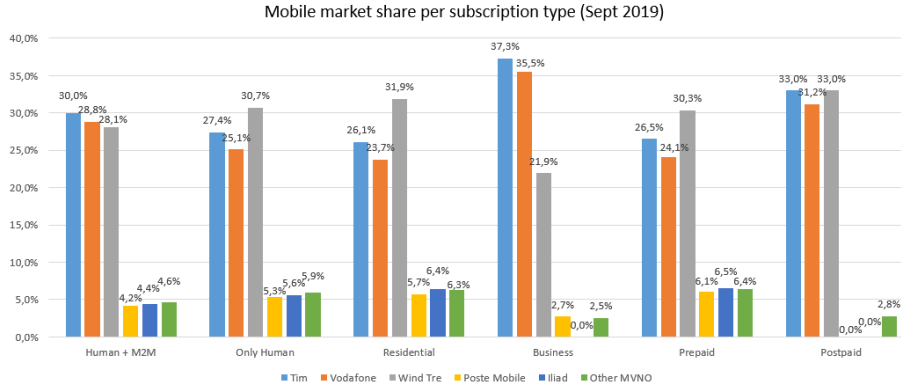


Figure 1.5: Source: AGCOM observational study

Tim and Vodafone catch up with Wind-3 thanks to M2M subscriptions; obviously, such sim cards are used only in business activities, which require a steady connection; hence, Vodafone and Tim, thanks to brand equity and intrinsic better quality dominate such segment.

Again, business consumers mainly choose Vodafone and Tim, which have higher connection quality, and, because such customers use telecommunication services for work, they rely on a better service provider, whereas residential customers are price-sensitive; indeed, MVNOs manage to compete only in the residential segment.

Instead, the postpaid segment has high concentration because it partially overlaps the business segment; indeed, subscription for business clientele is usually a postpaid contract. Here, Wind-3 reaches Vodafone and Tim's market share, because the two brands offer lots of mobile subscriptions in a bundle with low price smartphones, with the constraint for the customer to sign a postpaid contract.

However, the mobile market is moving the competition towards data consumption. Indeed, Figure 1.6 shows monthly average gigabytes consumption in recent years, highlighting a strong rise of the demand; indeed, supply has consequently increased availability of gigabytes included in monthly tariffs, also reaching 70 gigabytes per month.

Besides, recent enters of MVNOs have caused a substantial rise in the number of mobile switches among customers. Looking at Figure 1.7, only-human sim cards see a decreasing trend, moving from 88.2 million of subscriptions in 2015 to 80.6 million in 2019 (CAGR equal to -2.2%); however, overall mobile market is slightly increasing (CAGR equal to +1.7%) mainly because M2M segment more than doubled. Notably, switches among mobile brands are sharply rising, reaching 144 million switches in 2019, while in 2015 they were less than 86 million. Therefore, because overall mobile subscriptions are around 104 million, it means that on average consumers tend to stick to the same mobile operator for less than one year, thus increasing competition because brand loyalty is decreasing.

Again, HHI has been used to measure market concentration both in the overall market and in single segments, as shown in the following table:

Average monthly data traffic of SIM cards in Italy from 2012 to 2018 (in gigabytes)

Average monthly SIM cards' data traffic in Italy 2012-2018

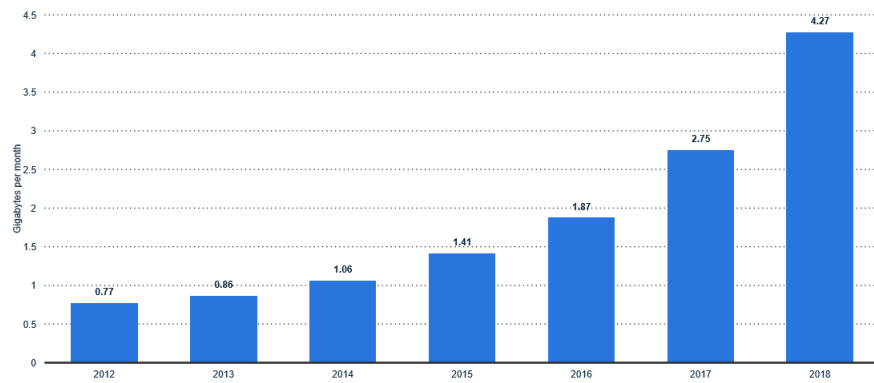


Figure 1.6: Source: Statista

Provider switches in mobile market

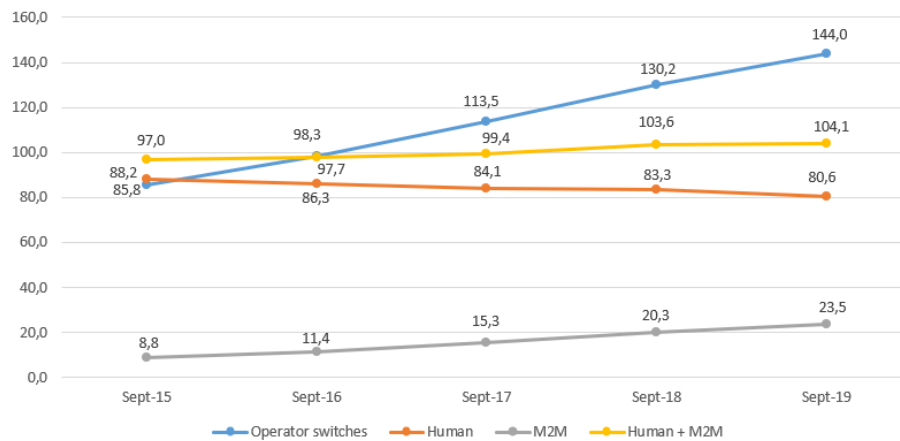


Figure 1.7: Source: AGCOM

Market	HHI
Overall (Human + M2M)	2,577
Only Human	2,417
Residential < 30	2,374
Business	3,145
Prepaid	2,322
Postpaid	3,159

Hence, all segments are concentrated or highly concentrated.

1.3 Competition analysis

Telecommunication firms tend to avoid Bertrand paradox with moderate differentiation and strong collusion. Indeed, even though the industry is not growing at a fast pace, they tend to cooperate mainly because of the very high frequency of competition periods. Furthermore, information is widely and easily accessible to all the firms so that they are able to monitor whether rivals deviates or not and, in case, to punish them.

In the telecommunication industry the main reason for the actual market power of firms over consumers is collusion. Not surprisingly, offers of leading telecommunication brands dated 16/02/2020, shown in Figure 1.8, confirm the collusion in broadband services; indeed, prices range between 24,95€ and 29,90€. Tim has the highest price of the market, meaning +11% than Vodafone, +7% than Fastweb, +15% than Infostrada-3, +20% than Tiscali, +11% than Linkem), thus confirming that the ex-monopolist competing in the market still has a higher appeal on consumer given by its historical position, as monopolist firstly and as incumbent after liberalization.

However, Tim's offer of 29.90 €/month for new broadband subscriptions are definitely different from average price per month for current Tim consumers. Indeed, from Tim's annual report it is possible to estimate an average monthly cost of 44.49€ per consumer. Indeed, in telecom services starting price is never equal to final price. Theoretically, the two main variables consumers should consider when evaluating which supplier to choose are price and connection performances. In September 2019 the speed test website *nPerf.com* published the barometer of internet connections in Italy. The report compared service performances of main broadband suppliers, as it is shown in Figure 1.9.

Despite that Tim is the leader in the broadband market, it provides the lowest performances in terms of download speed, upload speed and latency. Instead, Infostrada-3 leads the download speed (i.e., 65.48 Mbps), while Fastweb leads the upload speed (i.e., 25.48 Mbps). Finally, Vodafone has the lowest average latency (i.e., 38.42 Ms). Poor performances of Tim might be because many consumers remain with old contracts providing slow connections; therefore, Tim's infrastructure is not slower than its competitors'. However, precisely because many consumers use a slow service while having the chance to switch to a better tariff in the market, Tim takes advantage of its incumbent position in the market, exploiting its consumers' status quo.

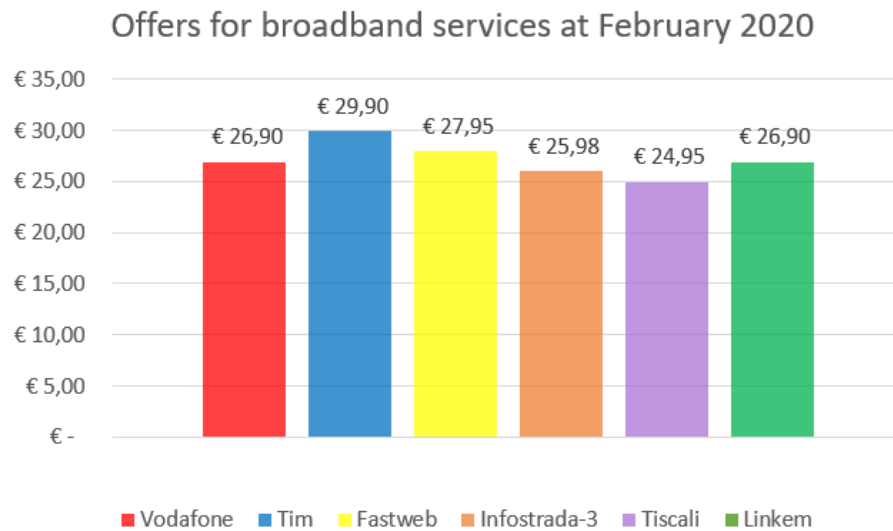


Figure 1.8: Broadband prices of main brands

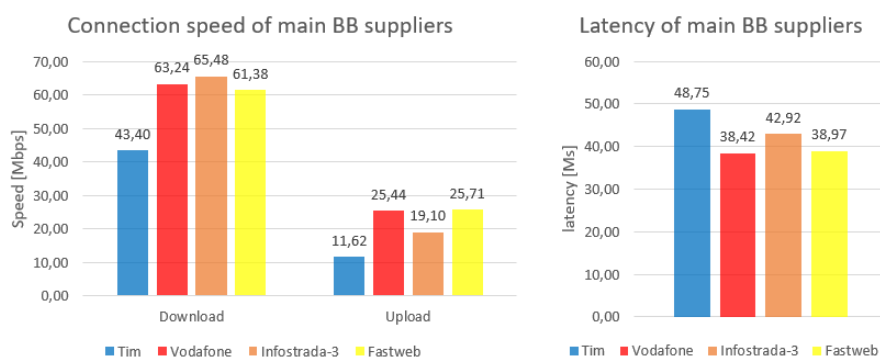


Figure 1.9: Connection performances of main BB suppliers

Size of the Internet of Things (IoT) sensors market worldwide from 2018 to 2027 (in billion U.S. dollars)

IoT sensors market revenues worldwide 2018-2027

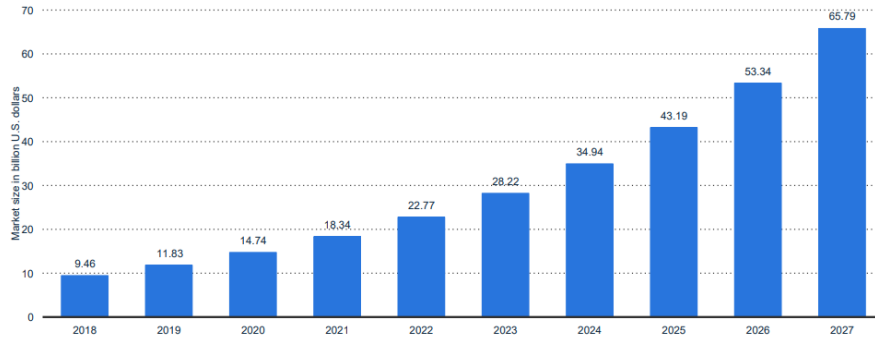


Figure 1.10: Source: Statista

1.4 Industry trends

Main trends concerning the telecommunication industry are the *Internet of Things* and the *5th Generation* connection. Such technological innovations are strongly complementary and will allow telcos to make the industry grow again. Thanks to IoT and 5G, telcos are trying to increase product differentiation by adding new services that are complementary to traditional telecommunication products, perceived as commodities by now.

1.4.1 Internet of Things

By *Internet of Things* (IoT) is meant all the technologies that allow any equipment to connect to Internet. It aims at creating innovative solutions that are able to monitor, control, transfer information in order to act consequent actions. However, there is a substantial difference between IoT and M2M sim cards: indeed, IoT needs M2M technology, whereas M2M does not need IoT. Formally, both the technologies put devices in communication, but within M2M technologies devices are connected to a close network, while IoT allows more M2M systems to be connected, thus creating an open network where devices interact with the human being. Therefore IoT can be defined as multiple M2M systems where all subjects (equipment, human, connections) operate in order to create a network of information that is gathered and exchanged through several devices equipped with sensors.

In order to work, IoT needs to collect and store a large mass of data; hence, it is critical to process, collect and analyze real-time Big Data for any context and any connected device. Hence, an integration between Big Data, Databases and IoT systems is necessary.

Figure 1.10 shows worldwide forecast on the size of the sensors market, which has an exponential trend of growth, going from 9.46 B\$ in 2018 to an estimation of 65.79 B\$ in 2027. Main applications of IoT systems are:

- smart home by connecting all domestic appliances and smart buildings by

connecting all equipment set up in a building (in both cases allowing, for instance, a reduction of energy consumption);

- robotic and automation of industrial production by substituting human manual work;
- smart city by connecting traffic lights, cars, street lamps;
- automotive and self-driving by connecting cars with smart cities;
- smart health by allowing physicians to use sophisticated medical devices and complex surgeries that would not be able without IoT;
- surveillance and security;
- digital payments by connecting, for instance, through wearables.

1.4.2 5th Generation

5th Generation (5G) is expected to be fully ready in 2022. Such technology will allow mobile connections to run at breakneck speed and minimum latency time (i.e., the time between emission and reception of the command), especially if compared to 4G connection: indeed, devices connected to 5G will be able to download at 100 Mbps and upload at 50 Mbps with a maximum latency of 4 milliseconds, against 20 milliseconds of 4G LTE connection. First tests on 5G have already been conducted worldwide by telecommunication brands. According to Ericsson, 5G applications will allow telecommunication operators to boost their turnover by size between 204 and 619 B\$, which corresponds to an increase between +12% and +37%.

In Italy the Ministry of Economic Development has already put in place the procedure to assign the rights for the usage of frequencies for 5G connection; it started on the 13th of September 2018 and ended on the 2nd of October 2018, generating an intense competition among telcos to get such rights; indeed, 171 rounds were conducted. Overall the State will cash more than 6.5 B€ from 5G operation, equal to an increase by 164% from initial offers and by 4B€ from the minimum threshold decided by Parliament in the previous budget law. More precisely, brand expenditures are presented in the following table:

Frequency bandwidth	Brand	Amount of money [B€]
700 MHz	Vodafone	683,236,396.00
700 MHz	Tim	680,200,000.00
700 MHz (reserved)	Iliad	674,472,792.00
3700 MHz	Tim	1,694,000,000.00
3700 MHz	Vodafone	1,685,000,000.00
3700 MHz	Wind-3	483,920,000.00
3700 MHz	Iliad	483,900,000.00
26 GHz	Tim	33,020,000.00
26 GHz	Iliad	32,900,000.00
26 GHz	Fastweb	32,600,000.00
26 GHz	Wind-3	32,586,535.00
26 GHz	Vodafone	32,586,535.00

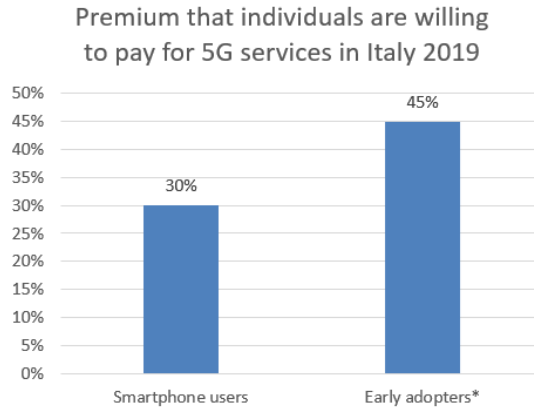


Figure 1.11: Source: Statista

Furthermore, the Ministry of Economic Development allowed authorizations to assign usage rights for experiments on 5G technology in five cities from 2017 until 2020: Vodafone will operate in Milan, Wind-3 and OpenFiber in *Prato* and *L'Aquila*, Tim, Fastweb and Huawei in *Bari* and *Matera*. Besides, some cities are conducting some tests on 5G technology:

- *Genova*, involving *Comune di Genova*, *Regione Liguria*, *Liguria Digitale*, Ericsson and Tim;
- *Roma*, involving *Comune di Roma*, Fastweb and Ericsson;
- *Catania*, involving Tim and Huawei;
- *Torino*, involving Tim and *Comune di Torino*.

5G is strongly complementary with IoT systems: indeed, the mobile network will allow simultaneous connections from multiple devices with high performances, which is not possible with actual technology. Moreover, thanks to the new standard, devices will be able to connect to Internet without Wi-Fi, thus without a broadband line. This is useful, especially when devices are moving outside a building, outside the home, or where infrastructures for ultra-broadband service are difficult to create.

Ericsson conducted a survey in Italy in 2019, highlighting that 69% of Italians are willing to pay more for 5G services. Indeed, on average, smartphone users are willing to pay 30% more than their current tariffs for 4G LTE services, while early adopters even 45% more (see Figure 1.11). Notably, the main reasons for an additional premium price for 5G services are "greater connection speed" (51%), "enabling of new services" (46%) and "network security" (35%), as shown in Figure 1.12.

1.5 Policy and regulation

The telecommunication industry is still concentrated even after years from liberalization from regulators; therefore, the regulator still plays a critical role

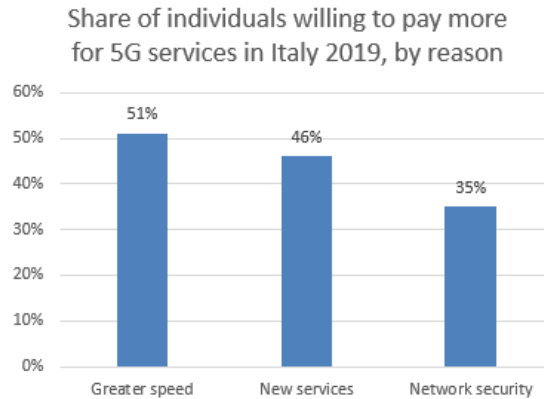


Figure 1.12: Source: Statista

in monitoring and controlling industry dynamics in order not to make telcos exploit their market power over customers and new entrants or weak competitors. Following, a description of liberalization of both mobile and fixed broadband market is presented, also with other policy intervention from the regulator of the industry (i.e., *AGCOM, Autorità per le Garanzie nelle Comunicazioni*).

1.5.1 Liberalisation of the mobile market

That of the '90s was the period of liberalization in the telecommunication industry. Indeed, the European Union pushed community members to put in place initiatives in favour of privatizations and liberalizations of more industries among which telecommunications. Hence, in 1990 Olivetti founded Omnitel Radiosistemi Cellulari Italiani aiming at entering the market, soon to be liberalized. Indeed, in early 90's Omnitel and Unitel (i.e. a second group willing to enter the mobile market, led by Berlusconi's Fininvest and Angelli's Racal Strategic Radio) sent Antitrust Authority requests to liberalize mobile telecommunication market against SIP (i.e. Società Italiana per l'Esercizio delle Telecomunicazioni S.p.A.), the monopolist of the industry at the time. The turning point was in 1993 when SIP's exclusive management of GSM technology for mobile connections was declared illegitimate. Hence, in 1994 the publication of the call for the assignment of mobile licences to a second Italian operator finally arrived. Omnitel Pronto Italia, a consortium of Omnitel and Pronto Italia, got such licences, whereas the consortium of Berlusconi and Angelli did not. From that moment the mobile market increased the competition in favour of final consumers. Incidentally, in 2011 the government concession fee (i.e. 5.16€ for residential subscriptions and 12.91€ for business subscriptions) was cancelled because it was deemed by more law courts as illegitimate and anachronistic in a market subject to privatisation and liberalisation for years.

1.5.2 Liberalisation of fixed-broadband market

Until 1997 Telecom Italia had the monopoly of the fixed-broadband market. After liberalization more operators entered the market but, because they didn't

have the infrastructure or didn't have sufficient financial resources yet, Telecom was obliged to let new entrants, also referred as OLO (i.e. Other Licensed Operators), use its infrastructure upon payment for the rental of cables. Nevertheless, the need for interconnection emerged, meaning the physical access to the infrastructure for the new operators, in order to let consumer benefit from Telecom's rivals services. Such interconnection was regulated by AGCOM, in order to avoid opportunistic behaviours from Telecom. Subsequently, such agreements took place through direct agreements between operators and Telecom. Main access services to Telecom infrastructure are:

- **ULL (unbundling local loop):** it is an agreement between Telecom and the OLO according to which the final consumer can use old copper twisted pair. Therefore, the OLO is directly responsible for the contract with the user, but Telecom assigns a slot to the OLO in order to set up its equipment necessary to connect the twisted pair with users. It is a full ULL when the end-user joins the new operator for both calls and internet connection, while it is shared access if the user joins the new operator only for internet connection;
- **Bitstream:** it is an agreement between Telecom and the OLO according to which the entire transmission capacity necessary to offer broadband access services to the end-user is given to the OLO; therefore, the wholesaler sells services to OLO which subsequently sells such services to the end-user. OLO directly responds to the contract with users.

In order to incentive OLOs in the creation of their infrastructures in "the last mile" (i.e., the cable from the cabinet to end-users' home) AGCOM decided that in areas where more than 50 lines are activated with unbundling, bitstream will not be available any more. Indeed, bitstream was so interesting for OLOs that, in the absence of such restriction, the most desired option was to rely on it and not to create new infrastructures. Thus, after 12 months that a given area reaches 50 lines in bitstream, Telecom must not permit new bitstream activation, while still allowing existing ones.

However, such unbundling seems to have caused a few problems in the management of the competition, because Telecom is a vertically integrated firm, while OLOs compete mainly downstream, thus finding difficulties to compete upstream. Indeed, Telecom throughout the history of competition in the broadband market put in place opportunistic behaviours against downstream competitors by blocking or delaying application of AGCOM's rules. Incidentally, instead of making privatisation as first step and liberalisation as the second step, maybe it would have been a better choice to simultaneously create an upstream private firm, regulated by AGCOM in price tariffs, and allow downstream competition. This way, a private firm competing alone upstream would have had incentives in being efficient because of the price cap, while downstream operators would have competed without incurring in troubles against the vertically integrated firm. However, at the time SIP had significant power over regulator choices, which, incidentally, seemed to be led the imposition from the European Union, instead of a real intention of increasing competition. Indeed, such liberalisation has been defined as lame liberalisation [23].

1.5.3 OpenFiber

Broadband market related to optical fiber has seen a new entrant as a wholesale-only operator, OpenFiber. In 2015 the Italian government launched the “BUL” project, through Infratel, a government company, aiming at reducing the digital gap by creating an ultra-broadband infrastructure among 95% of the population. The first call for tenders were related to the so-called market failure areas (also white areas), where none of the firms, including Tim, wanted to invest in creating the optical fiber infrastructure. Therefore, OpenFiber, a firm controlled by Enel and Cassa Depositi e Prestiti, won the call for tenders, obtaining funds for 3 B€. Notably, OpenFiber has the concession for such infrastructure for twenty years. OpenFiber, by using GPON technology, exploits electric cables, obtaining an extension of the optical fiber network without expensive operations. Hence, OpenFiber’s entry created the benefit of investing where Telecom did not want to invest.

However, in March 2020 Antitrust fined Tim 116 M€ because of abuse of dominant position against OpenFiber and other firms (i.e., Vodafone, Infratel, Enel, Wind-3). Indeed, Tim hindered competition in the calls for tenders aiming at creating infrastructure in market failure areas by modifying the plans of coverage Italian territory with its infrastructure in a non-profitable way. It did so during the execution of public procurement, simultaneously delaying the public procurement with legal means. Additionally, Tim changed its tariffs in the wholesale market in order to reduce OpenFiber demand, by fixing prices below the costs in some cases. Indeed, Tim’s goal was to exclude OpenFiber from the market, also with non-profitable practices, in order to benefit from future profitability being the only or the main operator in the wholesale market. In 2019 OpenFiber realized only 44% of planned infrastructure, partially due to Tim’s obstacles.

For a long time politicians were talking about a potential merger between OpenFiber and the company branch related to fiber infrastructure of Telecom, getting the benefit of having only one competitor. However, one problem arises with such operation: the creation of this player would not be neutral in the competition downstream; indeed, Telecom, being vertically integrated, would have incentives in favouring its clients at expenses of rivals’ clients. Obviously, in such a scenario the new company would be monitored and subject to AGCOM regulation. However, it is easy to imagine it might happen as it happened for the regulation of ADSL connection where Telecom messed up things in the slots of cabinet allocated to Telecom’s rivals in order to push their clients to come back to Telecom or just to speed up connection only to Telecom’s clients. This is why Telecom’s rivals do not desire such operation; indeed, all downstream competitors, except for Telecom, signed agreements with OpenFiber. On the opposite side, having two wholesale players would duplicate costs in some areas. In all this, it is still not clear what is the intention of Telecom on such merger.

1.5.4 Collusion on price increase

Recently AGCOM fined leading mobile operators, namely Vodafone, Tim, Wind-3 and Fastweb, because of collusion in fixing prices with tacit agreements. Indeed, they decided to bring billing period from one month to 28 days, meaning that the consumer would have paid 13 times per year instead of 12. As a

result of such practice, AGCOM obliged these brands to bring billing back to 1-month payments. However, telcos brought billings to 1-month frequency but simultaneously decided to rise the prices in a way that customers' overall annual expenses would have meant 13 payments per year with old tariffs. Such practice aimed at circumventing AGCOM's obligation. Indeed, the increase in price was equal to the 13th payment within a year. All this comported an increase by 8,6% in telcos revenues, which coincided with an equal increase in profits in absolute terms, since this was a zero-cost practice. AGCOM certificated agreements of these operators because they violated norms on competition of consumer code. Indeed, in order to be fined for price-fixing, it is sufficient that changes in prices have the same trend, even though price levels in absolute terms are different among brands. Incidentally, the four operators coordinated their commercial strategies related to price-fixing during a conference call the same day AGCOM obliged them to bring billing back to 1-month payments. Fines submitted to operators amounted to:

Brand	Fine
Tim	114.4 M€
Vodafone	59.97 M€
Wind-3	38.97 M€
Fastweb	14.76 M€

However, reimbursements to consumers are not automatic; therefore, it is the consumer who has to specifically ask for such reimbursement that will be given through billing reduction.

1.5.5 Wind-3 merger

In 2016 the European Commission, through its Member Margrethe Vestager, European Commissioner for Competition, approved the merger between Wind a 3 into the first (at the time) mobile operator competing in the Italian market. Such decision was taken after Wind-3 agreed on yielding redundant assets, namely telecommunication towers and frequencies, to Iliad, a new entrant coming from French market. Indeed, in absence of such concession, the market would have been more concentrated at the expenses of consumers. European Antitrust stated that the merger would not have penalized Italian consumers thanks to the presence of a fourth competitor. Besides, Commissioner's intention was to show that telcos can see growth not only through consolidation within the same country but also through competition in foreign countries. Indeed, competition in the mobile market in Italy increased determining lower prices for average tariff, demonstrating that allowing the merger was the right decision because it did not consolidate the market. Indeed, in Commissioner's considerations, at least four competitors were necessary in order to get the competition guaranteed.

1.5.6 Protection of consumer rights

Because telecommunication markets are highly concentrated, consumers often get their rights violated; therefore, *AGCOM* has listed a series of com-

pensations consumer can request when such rights are infringed (see *Delibera 73-11-CONS*):

- **Compensation for omitted or delayed activation of the service:** in case of delay in the activation of the service (the maximum term is written in the contract) operators must compensate consumer by 7.50€ per day of delay. If the delay regards additional services, such amount is reduced to one third (i.e. 2.5€ per day of delay);
- **Compensation for suspension or cessation of the service:** in case of suspension or administrative cessation (thus not due to technical issues) of one or more services without assumptions or in case the operator does not communicate it in advance to the consumer, operators must compensate consumer by 10.00€ per day of suspension and in any case not less than 100€. Instead, if such suspension regards additional services such compensation is equal to 2.50€;
- **Compensation for malfunction of the service:** in case of full interruption of the service due to technical issues, operators must compensate the consumer by 5.00€ per day of a technical disservice, while in case of random malfunction of the service (up and down of the connection stability) such compensation is equal to 2.50€;
- **Compensation for omitted or delayed portability of the number:** in case the number portability is not completed within contract terms operators must compensate the consumer by 5.00€ per day of omitted or delayed portability;
- **Compensation for activation of unsolicited services:** in case of activation of unsolicited services, the operator must compensate consumer by 1.00€ per day from the activation of such service; however, the minimum amount of compensation is 50.00€;
- **Compensation in case of loss of the phone number:** in case the phone number gets lost due to the operator's fault, the operator must compensate the consumer by 100.00€ per year of number existence;
- **Compensation for failure or delayed response to complaints:** in case the operator does not reply to a consumer's complaint it must compensate the consumer by 2.00€ per day of delayed reply; however, the minimum amount of such compensation is equal to 20.00€ and maximum is equal to 400.00€.

Operators should automatically compensate consumers immediately after the disservice is being ascertained. However, if the object of disservice is a business subscription, all compensations are doubled.

Consumers may request such compensations directly to the operator. In case of no agreement, *AGCOM* provides a tool, called *ConciliaWeb*, where the consumer can easily ask for such compensation: after filling a form, firstly consumer and operator try with an amicable settlement. Otherwise, a justice of peace will decide on the issue. However, such procedure seems to be time consuming, since the time from the moment of filling the form to the moment of receiving compensation is very long (sometimes one year); consequently, the risk

is to disincentive people in such opportunity, because taking too much time for an uncertain compensation might not be worth it.

Very recently *AGCOM* decided to implement another practice to protect consumer rights on Wi-Fi router: indeed, from 2020 consumers subscribing a new broadband tariff are not obliged to buy the modem provided by the operator anymore but are able, instead, to buy it autonomously elsewhere. Also, operators are requested to separate the billing documents of broadband service and modem acquisition. However, Tim appealed in vain; indeed, the request has been rejected.

Chapter 2

Behavioural economics

2.1 Behavioural economics

2.1.1 Neoclassical microeconomics

Neoclassical microeconomics proposes main models relative to theories of the firm, the consumer and the market. In short, firms maximize their profit function being constrained in terms of production means (capital and human workforce), while consumers maximize their utility function constrained in terms of income. Therefore, supply and demand curves meet in the market generating the optimal amount of good and the optimal price (see Figure 2.1).

Underlying assumptions on consumer theory in neoclassical economics include the following:

- **Perfect rationality:** people are supposed to maximize their utility function, assuming they are rational, thus by making optimal choices independently on the context; never happens to make sub-optimal choices that do not maximize utility function;
- **Perfect information:** people are provided with all available information when making decisions so that they manage to achieve optimal choice within the overall set of possible alternatives.

Utility function is a way to calculate consumer willingness to buy a good, depending on its quantities. More precisely, consumer assigns a numeric score to the goods. It is assumed that consumer is always able to assign a preference to all goods; therefore, a comparison among goods is always possible, in order to create a preference ranking. Neoclassical assumptions on consumer theory require the consumer to be perfectly rational and perfectly informed. Nevertheless, such assumptions are questionable. Indeed, it is difficult for the consumer to rationally assign numeric scores to good features, given the fact that consumer should be able to gather overall information about products, then be able to understand and interpret such information, and finally be able to process them in order to make an optimal choice on the basis of analytical computation. Such skills are quite challenging to be found on the average consumer, especially for products like telecommunication services. Besides, cognitive biases work against these two assumptions. Indeed, cognitive biases cannot be cancelled

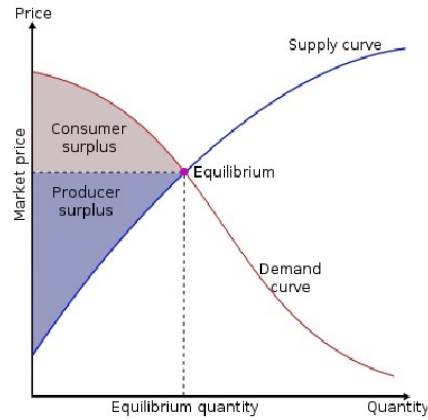


Figure 2.1: Market equilibrium

with external factors because they are intrinsic elements of people's mind. Main theories that try to challenge neoclassical assumptions on consumer choice are the *Bounded rationality* [51], *"Thinking fast and slow"* [34] and the *"Prospect theory"* [56], described in following paragraphs.

2.1.2 Bounded rationality

Simon is the first challenging mainstream economic belief on consumer behaviour, by doubting the existence of the *homo economicus*, a super-rational man who is always able to make choices by maximizing utility function. Such belief presupposes people being both economical and rational. However, things are not so easy to model. Indeed, people rational thinking is affected by several cognitive biases which will be listed later. Simon tried to model this kind of distortion of people rational thinking by developing the bounded rationality theory. Simon finds out that there are different dimensions where neoclassical consumer theory, if adjusted, looks more realistic when talking about the rationality of consumer. Main concepts of such adaptation of the model are:

- Utility functions are somehow limited in terms of types;
- Costs of gathering information and processing them exist and they are highly dependent on the context, generating deliberation costs;
- Consumer maximizes a utility vector, namely a multi-valued utility function.

Because of the complexity of context and consumer's inability to gather, to process and to deliberate information coming from the supply side, people tend to use heuristics and short-cuts to come to an acceptable decision. Hence, instead of making optimal decisions, they look for solutions which seem satisfying, because they achieve a given threshold level of utility.

When people face complex issues, gathering information is too expensive. Paradoxically, being perfectly informed results as irrational: indeed, researching

and gathering information produce a unit cost which increases as the amount of information increases, while utility provided by a new piece of information decreases respect to the amount of information. More precisely, the new piece of information might be a candidate to help for optimal choice or, on the contrary, it might generate an inferior utility if it did not help for optimal choice; besides, the more information is gathered, the less likely a new piece of information will generate higher utility than previous gathered information. Therefore, at a certain point, gathering a new piece of information has a higher cost than expected contribution to the utility function. Hence, people look for satisfactory choices rather than optimal ones.

Cognitive sciences provide many theories regarding how people use their capabilities to generate and identify alternatives. The main belief among cognitive theories suggest that people discover new alternatives by using heuristics within the search domain of the problem; the trick is that people don't know alternatives in advance. However, in real-world alternatives have several features and ways of combining them; therefore, the combination of a vast amount of information is complicated to compute; indeed, such problem belongs to non-polynomial problems. Such computational complexity is impossible to deal with for the human mind; thus, heuristics are mandatory to solve them within a reasonable time. Main computational problems when facing such situations are shown in Figure 2.2 and are:

- Cognitive limitations;
- Information imperfection;
- Time constraints.

It is necessary to look for alternatives which are more likely to solve a given problem. Therefore, it is necessary to find a standard methodology, also called arrest rule, describing how people find a satisfactory alternative. When looking for such criteria, the consumer follows these steps:

1. Identify alternatives;
2. Look for heuristics by using arrest rule;
3. Adapt the aspiration levels.

The concept of aspiration level is fundamental. Whoever needs to solve a problem forms a judgement on the quality solution aimed to achieve, taking into account reasonable efforts. Such judgement is generated based on previous experience and cognitive knowledge. Therefore, such experience influences the aspiration level, which is critical to determine stop criteria in the computational process. Nevertheless, when research seems to be unproductive, people tend to lower aspiration level. Simon states that such process leading to suboptimal choices defines substantial rationality, which is more reasonable than neoclassical assumptions.

However, the memory boundaries of bounded rationality are variable. Flexibly bounded rationality expands the bounds within which a rational decision-making process can be exercised and, thereby, increases the probability of making accurate decisions when compared to the theory of bounded rationality. Indeed experience helps to increase bounded rationality to its highest level of

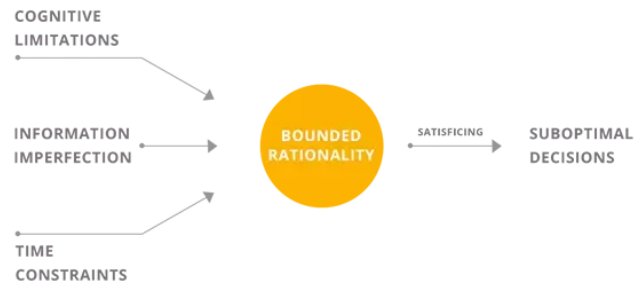


Figure 2.2: Bounded rationality

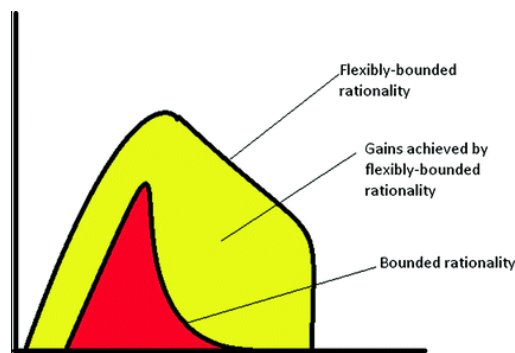


Figure 2.3: Flexible bounded rationality

flexibility. Hence, the principle of bounded rationality does not contrast the theory of rationality from neoclassical theory but simply determines the bounds within which it is reasonable to apply the principle of rationality.

2.1.3 Thinking fast and slow

Daniel Kahneman, Nobel Prize winner, developed a theory regarding how people behave when making a choice. In general, people think by using two different and dual thinking systems, namely *System 1* and *System 2*. As Kahneman states, "System 1 operates automatically and quickly, with little or no effort and no sense of voluntary control, while System 2 allocates attention to the effortful mental activities that demand it, including complex computations".

Therefore, *System 1* and *System 2* are characterized by the following duality:

SYSTEM 1	SYSTEM 2
Fast	Slow
Unconscious	Conscious
Automatic	Deliberate
Effortless	Effortful
Uncontrolled	Controlled
Unaware	Aware
Emotional	Logical
Subject to errors	Reliable

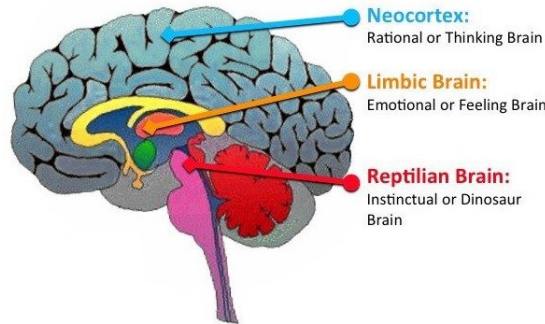


Figure 2.4: Human brain processing

Out of thousands of choices, people deal with every day, people use *System 1* for 98% of them, while use *System 2* for 2% of them. However, both systems have a few issues. For instance, *System 2* is a lazy controller and does not like to put too much effort. One of its function is to monitor and control thoughts and action suggested by *System 1*, but sometimes it does it with bounded rationality, according to precedent process, suggested by Simon. Sometimes external mechanisms might trigger the use of *System 2*, such as gamification approach.

The two systems use different parts of the brain. Indeed, *System 1* uses the limbic brain, related to emotions and feelings, and reptilian brain, related to instinct, while *System 2* uses neocortex, related to rationality and deep thinking, as shown in Figure 2.4.

2.2 Behavioural insights

2.2.1 Definition of behavioural insights

Modern economic philosophy does not have only one vision but three. Indeed, American, European and Chinese governments see the economy from different perspectives. The US believes competition with almost no rules leads to higher overall welfare, especially if the government does not intervene distorting markets behaviour; therefore, consumer behaviour is expressed similarly to neoclassical logic, given by optimal match of supply and demand. This should generally happen in perfect competition scenarios. On the opposite side, China believes economy must be hyper-controlled by the State, which is the main driver of economic impulse; indeed, a considerable transformation moved Chinese economics from a socialist totalitarian system to a totalitarian capitalist system. Therefore, consumer behaviour is controlled by governments. In the late years, issues related to the privacy of consumers arose both among American and Chinese citizens because of the emergence of Big Data: indeed, on one hand consumer data are managed by big private corporations (e.g. Facebook, Amazon, Google, Apple), and the government manages consumer data on the other. Between these two economic systems, there is European government, which believes economy should tend to a competition system; but, because of several market failures both from supply and demand side, economy should

be regulated. When dealing with irrational consumer behaviour, policymaker should nudge people behaviour not by forcing it but by inducing it. Such economic perspective is also called paternalistic economy. Therefore, three main economic systems rule modern markets in the world: high competition in the US, totalitarian capitalism in China and paternalism in Europe.

European governments very often rely on behavioural insights (BI) in order to calibrate policy measures. Firstly, one specification is mandatory: while market failures related to supply-side are structural problems, market failures on the demand side, thus affecting consumers' perfect rationality and perfect information, are behavioural problems, that policymaker might ideally solve by using behavioural insights. Therefore, BI is an approach to apply policymaking that is based on behavioural and social sciences, which include decision making, psychology, cognitive science, neuroscience and group behaviour. The "behaviourally-informed public policy" differs from the traditional one because it uses an inductive method, which uses theoretical psychological foundations, in contrast with the traditional deductive method. *OECD* defines BI as follows [11]:

"Behavioural insights (BI) aim to improve the welfare of citizens and consumers through policies and regulations that are formed based on studies, derived using experiments and observation. BI is about taking an evidence-based approach to policy making, empirically testing different approaches to solving issues and problems before considering their implementation. By using a mix of traditional economic strategies and insights from psychology, cognitive science and other social sciences, it identifies patterns of behaviour that replace and challenge established assumptions on what is thought to be rational behaviour".

Public policy is a circle. It does not apply universally to all policy situations; indeed, it is a theoretical model, thus fallible by nature. Notwithstanding its imperfection, it helps to conceptualize basic policy steps as a circular process [6] (see Figure 2.5).

OECD conducted a study highlighting that among 150 cases of projects where BI has been applied, the majority of such projects used BI approach at the end of policy cycle; probably the main cause is that BI is primarily focused on results rather than focused on a more extensive and systematic change in policymaking. However, BI approach applied also in early stages of the policymaking process might provide useful insights rather than just apply them as a mere ex-post evaluation of the intervention. Cons of ex-ante approach in BI is the additional effort in terms of time, costs and resources, which are often limited. Nevertheless, usually applying BI from the beginning of the policy cycle generates more effective long-term interventions. Besides, BI is a powerful tool to collect data from the market through tests and experiments, that can be useful not only for current studied behaviours but also for behaviours belonging from different markets. Therefore, policymakers, when applying BI, should discuss the following themes:

- Providing "buy-in" elements that can be helpful for future and more complex projects;
- Giving access to all practitioners in order to help them in successive studies and include overall stakeholders of each context;

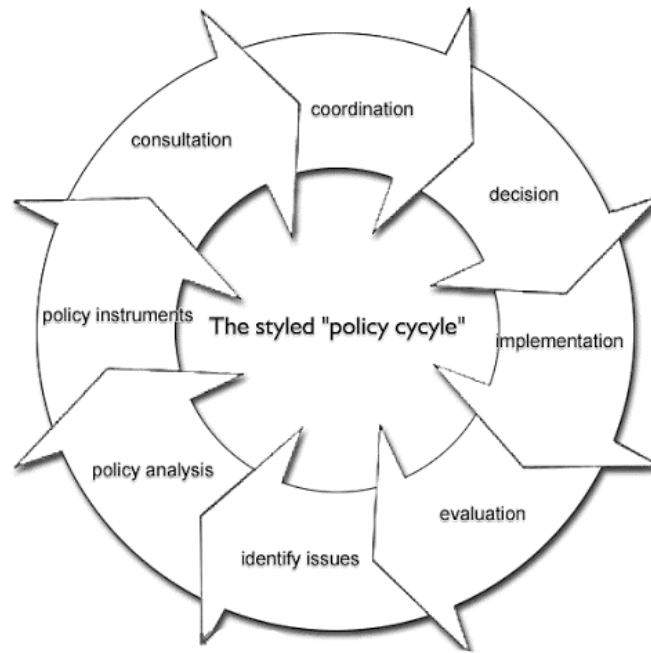


Figure 2.5: Policy cycle

- Providing cost-effectiveness solutions in order to be realistically applied in the real world;
- Establishing effective partnerships in order to apply interventions in real-world effectively.

2.2.2 Behavioural insights in the policy activity

Before illustrating a few BI approaches in policy activity, it is necessary to avoid common confusion in terminology. Indeed, often practitioners confuse behavioural economics, behavioural insights and nudging: behavioural economics is a science that develops models of human decision making by taking inspiration from social psychology to adjust neoclassical economic models of utility maximization. Behavioural insights are insights coming from the market by applying interventions related to cognitive biases; nudging is a type of intervention aiming at making people change their behaviour as policymaker considers optimal.

Agriculture

Common Agricultural Policy has been applied from 1992 in order to reduce the negative impact of fertilizers on the environment. Farmers are individually asked to sign contracts where they undertake to voluntarily use environmentally friendly practices in exchange for annual reimbursement from the government since such practices are more expensive than traditional ones. However,

	Alternative A	Alternative B	Current situation
Reduction of herbicides use in proportion of present use ①	30 % reduction 	60% reduction 	
Supplementary localized use of herbicides (max 10% of the committed area) ①	Allowed 	Allowed 	
Collective and final bonus for each farmer committed if 50% of ①		Final bonus 150€/ha 	
Administrative and technical assistance ①	Not included 	Included 	
Payment per year and per hectare subscribed ①	170 €/ha/an	330 €/ha/an	
1. Choose your preferred option →	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

↓

2. What area of your vineyard would you engage in the chosen alternative? _____ ha

Figure 2.6: Frame for fertilizers choice

few farmers participated to the initiative making the economic effort a waste of money; indeed, the economic effort is worth it only if more farmers simultaneously enrol such practices and if it is not jeopardized, because they are effective only beyond a minimum scale. Below such scale, environmental gains are not worth the costs for reimbursements. Therefore, it is critical to develop cooperation among farmers in order to achieve the desired threshold. In 2011 the Netherlands decided to make farmers jointly sign contracts of cooperation, whereby each farmer undertakes for a collective commitment related to the use of environmentally friendly fertilizers, thus signing a collective contract with shared gains in terms of reimbursements. Options of the contract are shown in Figure 2.6. Such program increased fertilizer use by 11% among farmers [37].

Charity

An interesting study on social influence on people behaviour has been conducted in a Swedish supermarket chain, regarding the donation of recyclable products. Notably, people were asked to decide whether to keep the recycled amount of recycle cans and bottles or to donate them to a charity organization. In order to nudge people generosity towards donation, a big paper showing big eyes looking at people has been put in front of decisional point, aiming to simulate that the decision is made in public rather than privately. The research found that donation, when the store was crowded with people, increased donations by 30% compared to non-crowded moments where people were asked to make a decision [17].

CO2 emissions

An experiment on consumer behaviour tried to understand if frame and default options might influence people decisions regarding CO2 emissions. Two different treatments regarding default options have been conducted: in opt-in treatment users were asked to click for carbon offset option, whereby consumers had to pay an additional fee for such option; while in opt-out treatment users were asked to be excluded from payment for carbon offset, whereby such fee was included in the initial proposed price. Results showed that people were more likely to passively accept the default option rather than actively choose an environmentally friendly option. In particular, framing influenced travellers' willingness to pay 10 extra euros for a flight ticket to mitigate their CO2 emissions, that is, 81% decided to pay extra fees in default option treatment and 61% when an active choice had to be made [3].

Driving licence

In 2003 Italy decided to introduce driving licence with a scoring system; hence, people begin their driving licence with maximum score (20 points), which is reduced when a person commits an accident and is responsible for that. This system creates virtuous incentives in people because they are intrinsically averse to risk; indeed, driving irresponsibly has the risk to lose points and see driving licence withdrawn. However, such a system does not have only negative incentives, but also positive ones, namely when drivers behave appropriately. Indeed, every two years, if the driver does not commit any accident, receives two additional points. The new system has provided concrete results; victims halved compared to ten years ago: in 2002 378,492 passengers got injured and 6,980 of them died, while in 2011 injured reached 292.019 (-25.5%), and victims reached 3,860 (-44.7%). However, younger drivers were the one losing the majority of points; instead, comparing gender behaviour, women left on the table fewer points than men, respectively 25.44% against 56.33%.

Finance

In finance, investment choices are strongly influenced by the perceived risk of investors rather than real risk. Perceived risk is not caused by objective measures, but by cognitive biases and irrational behaviours, in addition to how information is provided. An experiment conducted among 254 retail investors in Italy tries to capture investors' judgements in terms of complexity, utility, informative content, perceived risk, willingness to invest considering risk and return relation. Risk has been shown to potential investors with four different frames and representations. Main insights include the following:

- In general, complexity and utility are inversely correlated, so that an informative card results less useful when judged complex;
- In general, when perceived complexity increases perceived risk increases as well;
- In general, when information is deemed salient, there is a higher understanding of card information and investors have a higher willingness to

_____ has long been a steward of the environment. Here at _____, we have a number of efforts in place to care for our planet ranging from water and energy conservation, recycling and low - emission park vehicles to eco - conscious options for Resort Guests.

I care about the environment at home and when I travel. As a friend to the earth, I will do my best to save water and energy by re - using my towels during my stay.

☐ Yes ☐ No, Thank you

Figure 2.7: Commitment for environmentally friendly behaviour

invest, while when information is deemed obscure and incomprehensible investors have lower willingness to invest.

Hence, this experiment showed that risk is affected by how financial information on risk is framed, especially for less-educated investors [26].

Hotel

A study conducted among hotel guests provides interesting insights into their behaviour related to self-commitment. Indeed, when checking-in guests were asked whether to commit themselves to ethical behaviour concerning energy, water and towel consumptions. People were not aware they were part of an experiment and that their behaviour was monitored because; otherwise, their behaviour would have been biased. Hence, guests were asked to commit to environmentally friendly behaviour related to towel re-usage in order to reduce energy and water consumption. Thanks to this simple request to self-commitment over 25% of guests were more likely to re-use towel in order to be stick to their commitment [5].

Tax compliance

Uk government tried to change citizens compliance regarding tax payments by those who had declared their income but have not paid yet. Therefore, the government decided to send citizens behaviourally-informed messages to late payers with a social comparison with other citizens, thus triggering social norms people belief to uniform, because of sense of community characterizing

citizens of the same city or country. The message informed people with the following state: "Nine out of ten people in the UK pay their tax on time. You are currently in the very small minority of people who have not paid us yet". Such message aims at making people feel out of the majority of citizens, thus nudging them in paying taxes in order to conform to social norms. The minority social norm message produced a 5.1% increase in taxes paid within the 23 days trial period (equivalent to £2,367 million) [28].

Water consumptions

An experiment among 80 female swimmers monitored their behaviour related to water consumption while showering. Firstly, women were showed whether they were wasting water or not while having a shower. Subsequently, they were asked to make a public commitment to water consumption reduction after they saw their actual consumption. Finally, a combination of both interventions was applied, whereby swimmers were asked to stick to commitment and then they were shown water waste caused by their behaviour. This way, people would feel hypocritical because making a public commitment and then wasting water shows cognitive dissonance. Indeed, the latter condition had a statistically significant impact on the length of the shower: cognitive dissonance group took 30% shorter showers on average than the control group [14].

Traffic lights for broadband service type

Few studies have been conducted for the application of behavioural insights to the telecommunication market. Italian telecom regulator, namely AGCOM, approved a document imposing broadband services providers more rigid rules related to the use of "fiber" word in communications to consumer. Indeed, there are different types of fiber; therefore, it is difficult for the consumer to understand differences, which are related to the technological field, far from the average consumer's knowledge. Authority decided to use symbols to inform the consumer on the broadband type. Indeed, providers must follow these denominations when talking about fiber:

- **F (green colour)**: it refers to FTTH and FTTB, that is connections which provide arrival of optic fiber to the building or even to end-users home;
- **FR (yellow colour)**: it refers to FTTC and FWA, that is connections which provide arrival of optic fiber to an intermediate node, such as road cabinet still using a copper cable to get to consumer's home;
- **R (red colour)**: it is referred to services not using optic fiber, therefore still relying on copper cables to get to consumer's home;

Providers are obliged to use maximum transparency in advertising and contract communications; therefore, such traffic lights should be easily readable or audible from the consumer.

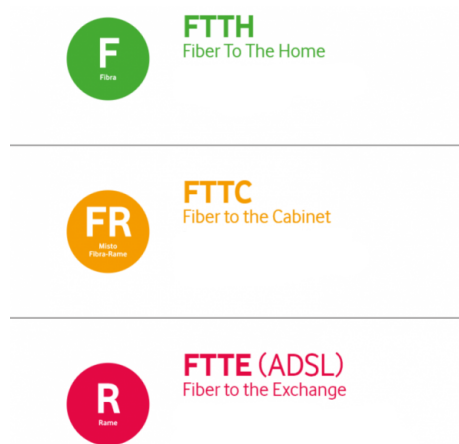


Figure 2.8: Broadband traffic lights

2.3 Cognitive biases

"A cognitive bias is a systematic (non-random) error in thinking, in the sense that a judgment deviates from what would be considered desirable from the perspective of accepted norms or correct in terms of formal logic" [4]. Again, this statement unsurprisingly highlights how mistaken is assuming people super-rationality, especially regarding consumers, which cannot know everything about everything.

Cognitive biases are due to different reasons. A simple but effective taxonomy on cognitive biases has been provided by (Martie G. Haselton et al.)[8] and is listed below:

- **Heuristics:** people suffer limited time and/or ability to process information, depending on the saturation of computational ability, or lack of knowledge on the information processed or other types of constraints; therefore, they rely on shortcuts or rules of thumb mechanisms that are inclined to happen systematically. Indeed, people use heuristics because elaborating a sophisticated strategy would generate an effort more costly than the benefits of obtained accuracy. The higher cost is given by the fact that people would have to spend energy on brain activity, but energy is not unlimited; thus, it would be subtracted to other activities. If the motivation for other activities is higher, then people use heuristics. "Linda problem" [58] is a very famous study conducted to show how often people fail when dealing with probability. Participants were asked to read the following brief description of Linda's personality: "Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice and participated in anti-nuclear demonstrations". After reading, they were asked to determine which of the following statements had the highest probability of being right about Linda's personality: (a) "Linda is a bank teller" or (b) "Linda is a bank teller and active in the feminist movement". Rationally thinking, the probability of A statement is not

lower than B; however, 80-90% of people gave the conjunction option as the more likely. Twersky and Kahneman found the explanation of this mistake in representativeness, which is how A resembles B; thus, being a feminist and a bank teller represents being a bank teller alone;

- **Error management bias:** it is about selecting favoured bias toward the less costly error: although error rates are increased, net costs are reduced. Indeed, every decision affected by cognitive biases may lead to two different types of error: a false positive and a false negative, respectively the adoption of a belief that is wrong instead, and the rejection of a belief that is true instead. This is an inevitable burden when living in the probabilistic world. The magnitude of biases is affected by an asymmetry of the cost of the two errors (people are led to choose the less costly error) and the amount of uncertainty in the task (people are led to more certain options). Interactions and beliefs between male and female world explain this phenomenon: while men tend to overestimate sexual perception coming from a woman, women tend to underestimate a man commitment in a relationship. Hence, on one hand a man is led to interpret a woman clue as a sexual interest because the cost of rejection (false positive) is higher than the cost of a missed opportunity (false negative). A woman is led to believe a man is not committed to their relationship because the cost of a long-term relationship ended up (false positive) is higher than the cost of immediately ending up a long-lasting relationship (false negative) [29]. These asymmetries have scientific mechanisms, yet not so crucial for the thesis;
- **Artifacts:** these are errors related to research strategies: they derive from the wrong application of normative standards (wrong problem format) or placement of the human in the unnatural environment (wrong problem content).

The scientific community has provided a massive amount of cognitive biases. Terry Heick has created "THE COGNITIVE BIAS CODEX", a graphic tool representing more than 180 cognitive biases belonging to four categories:

- Too much information;
- Not enough meaning;
- Need to act fast;
- What should we remember?

Among a vast amount of cognitive biases, those affecting the economic field the most are selected and analysed. Three primary contexts where cognitive biases occur are identified:

- Decision making, belief and behavioural biases;
- Social biases;
- Memory errors and biases.

2.3.1 Decision-making, belief and behavioural biases

Anchoring

It is a cognitive bias occurring when people anchor on a piece of information rather than relying on the overall set of information [64] [24]. Sometimes, it is the first information provided, sometimes the latter. Hence, in negotiations, when there is information asymmetry between principal and agent, it becomes critical the order in which information is provided. Indeed, once the anchor is set, all the subsequent negotiations turn around anchor information. For instance, if the customer is price-sensitive, the company should be aware of the moment when to provide price level depending on whether the company conduct a cost leadership strategy or a differentiation strategy. While in the former case price should be the anchor, in the latter, the main differentiation element should be the anchor. Again, when dealing with price, if the starting point is a generic price (e.g. 100€), the anchor is weak, and it leads to a lower final price, compared to a scenario in which initial price is specific (e.g. 99€)[30]. Furthermore, while negotiators making the first move end up with low satisfaction after the deal [49], they obtain the best outcome among players. Because first-mover does not know the reservation price of the other player, low satisfaction might occur; thus, after the deal, he may realize he could have set a higher anchor price.

Bandwagon effect

It is a cognitive bias occurring when individual ideas, beliefs and decisions are affected by those of other people, whereby individual act as other people do. In economics, this phenomenon occurs when demand for a particular good increases for the fact that other people consume that good. Main reasons of bandwagon effect are need of belonging to a social group (even if only aspiring to), need to be fashionable and/or stylish, need of appearance [38].

Belief bias

It is a cognitive bias occurring when people agree with some arguments based on the strengths of the conclusions, not on the strengths of the logical explanation leading to those conclusions. Therefore, people tend to accept conclusions matching with previous thoughts on a given argument and to reject them when there is a contrast. It is similar to confirmation bias because people are always looking for elements that support their preliminary thoughts, even when logical reasoning leads to contrasting evidence. This may be explained by a sort of contrast between *System 1* and *System 2* of people's dual-process cognitive approach to thinking: when belief bias occurs, it is *System 1* overcoming *System 2*, because people choose the conclusion that better fit with the precedent vision of things. Indeed, belief bias is more likely to occur in rapid responding situations because they use automatic thinking, thus not based on slow logical and rational thinking [18].

Confirmation bias

Similar to belief bias, it is a cognitive bias occurring when people prefer information consistent with the initial hypothesis and refusing information opposing

to them. This is because people like to be right and sometimes do not accept to be wrong [45]. Even when conclusions are not well defined, thus ambiguous, people tend to interpret them to confirm their hypotheses. Confirmation bias leads to overconfidence. For instance, in finance when talking about the political stock market (i.e. trade contracts whose value is influenced by the outcome of political elections), traders achieving higher income are those interpreting a political debate performance from a neutral perspective rather than from a partisan, thus biased, perspective [21]. Besides, in social media, the "filter bubble" effect is a problem, whereby users, while surfing on Internet, are offered to read only information that better match his personal beliefs on the base of precedent historical searches. Therefore, people surfing in social media environment are not aware they are in a bubble, thus locked inside a state of isolation from other different points of view conflicting with their one. Social media networks developed their algorithms in order to strengthen these barriers because people would spend more time on the social network when consuming information that is closer to the user.

Conjunction fallacy

It is a cognitive bias occurring when people think that specific conditions are more likely to happen than general conditions. An example has been provided when talking about Linda's personality.

Curse of knowledge

It is a cognitive bias occurring when people with higher knowledge on a subject have problems in providing information to people poorly expert on that subject. It is a widespread issue in principal-agent relation characterized by asymmetric information. Better-informed agents are supposed to reproduce the judgments of less-informed agents. However, this assumption does not always work. Indeed, better-informed agent, because they know the intrinsic value of the good sold, fail to sell it because they overprice a high-quality good and underprice a low-quality good, thus failing at maximizing profits; instead, a less-informed agent sells it at a price considered acceptable. This is because a low-skilled principal is not aware of the intrinsic value of goods, especially if it is about a complicated matter (e.g. finance, technology).

Default effect

It is a cognitive bias occurring when people are provided multiple options, but one option is automatically selected as a default option; therefore, people are not requested to choose among equally framed options, but they should choose whether to confirm the default option or to move from it in order to choose another option. The presence of default option profoundly changes behaviour regarding choice. It might seem a similar framework, but it is radically different: indeed, the absence of default option requires an active attitude, while it is required a passive attitude in the presence of default option. It is well documented that people tend to choose the default option, and they do it for different reasons:

- Lack of knowledge: people may opt for the default option because they don't know much about the matter, whereby default option is suggested to be the correct choice;
- Lack of attention: people may decide to choose the default option because they do not know their making a choice;
- Lack of motivation: very often people do not have time or do not want to make an effort to evaluate options, especially in a digital environment where usually people rapidly accept default options;
- Loss aversion: in uncertain situations loss aversion may make people not change default options because a mistake in this choice would cause regret and self-blame; instead, a wrong decision when selecting default option would appear someone else's fault;
- Social norms: default option is deemed to be socially accepted, especially when the choice is public; therefore, people choose the options people usually choose, becoming this the default option.

In other words, the default option creates switching costs. Multiple cases can be taken as evidence of the default effect: marketing acceptance of receiving e-mails for communications and advertising, request to be donator or not [31], request to choose energy produced with environmentally friendly means of production [44], and so on.

Denomination effect

It is a cognitive bias occurring when people tend to spend the same amount of currency in different smaller denominations of money rather than one big shot. An immediate example of denomination effect occurs in behaviour related to gambling: indeed, people prefer to spend money in small gambles repeated multiple times than one big gamble, even though probability does not suggest this behaviour. (Raghubir et al.) conducted a famous experiment aiming at studying denomination effect [47]: they proved that the likelihood of spending is lower when the sum of money is represented by a single large denomination rather than multiple small ones. Nevertheless, a small amount of money is perceived as "non-real money", while a substantial amount represents "real money". This phenomenon has profound consequences in finance and consumption behaviour.

Disposition bias

It is a cognitive bias occurring when, in finance, people tend to keep assets whose value dropped and to sell assets whose value jumped. Kahneman and Tversky [50] highlight "a general disposition to sell winners too early and hold losers too long", caused by a combination of tax considerations, regret aversion, self-control and mental accounting. The "prospect theory" may explain this effect, in which potential losses have a higher emotional impact than potential gains, because of people intrinsic loss aversion.

Endowment effect

It is a cognitive bias occurring when people tend not to sell a given good at a specific price when they own it, but they would not buy it at the same price if they do not own it. While in the latter case consumer considers his willingness to pay and compare it with the price, in the former case the consumer considers his willingness to accept, which is the minimum amount of money a person would accept to abandon a particular good. Endowment effect suggests that the willingness to accept is higher than the willingness to pay. Prospect theory [56] introduces the concept of reference point when people evaluate the willingness to pay, which depends on the reference point itself;

Framing effect

It is a cognitive bias occurring when changes of a particular choice depend on how the same information is provided (i.e. depending on the frame where information is presented to people). For instance, people tend to avoid or seek risk, whether a positive or negative frame is presented [57]. When asking a patient to choose whether to undergo critical surgery, the mortality rate is the positive frame (positive not because death is the desirable surgery outcome, but because the chance of death is the positive information people is looking to process); therefore, it is better to present survival rate rather than mortality rate. The information has the same meaning, but it is framed differently. Again, the explanation of this effect falls within prospect theory. The loss of processing the mortality rate is higher than the gain of processing the survival rate.

Gambler's fallacy

It is a cognitive bias occurring when people erroneously believe that two or more events statistically independent are deemed as dependent. A simple example is coin toss: after multiple consequent tails, people may think the probability of getting head is higher than the probability of getting tail; incidentally, it is wrong. Indeed, there is a substantial difference between ex-ante and ex-post probability. People very often confuse the two. This effect is also called Monte Carlo fallacy: at the Casino de Monte-Carlo in 1913 the ball fell on black twenty-six times in a row, causing gamblers to lose millions because they bet on red; unfortunately, the twenty-seventh time it was again black.

IKEA effect

It is a cognitive bias occurring when people excessively overvalue goods or actions that required personal effort, like building an IKEA bedroom. This effect is an external factor increasing quality to the intrinsic value of the object. This way, people autonomously create switching costs.

Sunk cost fallacy

It is a cognitive bias occurring when people's choice is affected by the presence of sunk cost: for instance, a young couple bought a room in a foreign state with non-refundable payment but is wondering whether to travel because of a recent war. The utility of travelling suddenly drops because it would not be safe

to travel in a country with an ongoing conflict; sunk cost fallacy occurs if they decide to travel in any case because they would "lose" their money.

Neglect of probability

It is a cognitive bias occurring when people do not take into account probabilities even though they are dealing with situations affected by uncertainty. This phenomenon is strengthened when emotions play a critical role. For instance, it has been noticed that after the 09/11 air flights market got in trouble because of a sudden drop of demand [53]; although the probability of another attack was the same before and after 9/11, some people decided not to travel by flight. Incidentally, after the terroristic attack, the US enormously increased security controls; thus, another terroristic attack would have been even less likely. In that case, fear prevailed on every rational reasoning.

Present bias

It is a cognitive bias occurring when people attribute higher pay-offs to gains related to time buckets closer to the present time than those far from the present time [43]. This is caused by two factors: the assignation of higher weights to closer pay-offs than far ones or the use of hyperbolic discount of future pay-offs. In both cases, the outcome is the same, which is the bias of a particular decision. Consequences of present bias are insufficient saving for pensions, consumption of unhealthy food, undervaluing future costs of a wrong diet, delay in taking decisions. Such consequences have in common the postponement of something (see also student's syndrome).

Rhyme as reason effect

It is a cognitive bias occurring when rhyme sentences are deemed as more trustful. It is an irrational effect caused by the repetition of a particular sound, strengthening the information that the sound brings with it. Indeed, rhyming can lead to more familiar statements, can increase fluency of statements or can improve just the aesthetic of the statement. This phenomenon is persistent in advertising. Incidentally, it was used in justice court as well: everyone will remember the defence in O.J. Simpson case where Simpson's lawyer trying to persuade popular jury by saying "if it does not fit, you must acquit".

Status quo bias

It is a cognitive bias occurring when people tend to rely on the current status quo, even when rational thinking would suggest to change the status quo and move on. Status quo leads to cognitive inertia and action inertia, thus creating a vicious circle strengthening the status quo and increasing switching costs.

Women are wonderful effect

It is a cognitive bias occurring when people have a more positive attitude towards female than the male gender. However, this effect decreases in more egalitarian cultures when talking about gender gap [36].

2.3.2 Social biases

Cheerleader effect

It is a cognitive bias occurring when seeing other people more attractive if they are in a group rather than alone, both for male and female faces [61]. This works when three hierarchical encodes occur, namely:

- The visual system of people considers the ensemble representation of faces within a group; thus, it does not consider it as a sum of individual faces;
- Perception of individual faces is biased towards the average ensemble representation as if the overall group has its image;
- Average faces are more attractive than single ones because the average mitigates singular distances in terms of aesthetic taste.

Shared information bias

It is a cognitive bias occurring when people spend time, money or other resources with people closer to them in terms of similarity. Indeed, people tend to belong to groups; therefore, they tend to replicate what members of the belonging group do. This also holds when dealing with groups to which one aspires to belong.

2.3.3 Memory errors and biases

Bizarreness effect

It is a cognitive bias occurring when people tend to remember better bizarre information rather than common ones. Indeed, every day people are bombed by multiple information. Overload information produces memory saturation; therefore, bizarre information emerges from a vast amount of different information; on the contrary, standard information does not emerge from everyday information.

Google effect

It is a cognitive bias occurring when people tend to forget information because this information can be easily read searching in online research platforms; incidently, Google is the first of these means. It is also called digit amnesia.

Humour effect

It is a cognitive bias occurring when people tend to remember better information provided by using humour. This is similar to the bizarreness effect because humour is distinctive from other types of information, thus easier to remember.

Lag effect

It is a cognitive bias occurring when people remember things when the same amount of information is temporally spread out rather than assimilated in a single time. This is what teachers always suggest to the student, who unsurprisingly do not listen.

Peak-end rule

It is a cognitive bias occurring when people better remember the peak of an experience plus the end of it. Therefore, it is these two moments the count the most in order to remember an experience, not the average.

2.4 Risk aversion

2.4.1 Prospect theory

Neoclassical theory related to consumer behaviour does not work when people deal with probabilities and uncertain contexts. Therefore, Kahneman and Twersky developed a model adjusting the neoclassical model to situations of uncertainty, with the so-called "Prospect theory" which led Kahneman to win Nobel Prize in 2002 "to have integrated results from psychological research in economic sciences, especially regarding human judgment and decision theory in conditions of uncertainty". Main insights from their research lead to the following considerations:

- Context effect: it is the framing concept indicating that context within which people make decisions has a strategic influence on such decisions; this is because people form the same problem differently if put in different contexts. Generally, a decision may generate positive or negative pay-offs, depending on the reference point. Therefore, if a specific result is deemed as a gain decision-maker tends to take less risky decisions; instead, if a specific result is deemed as a loss decision-maker tends to make riskier decisions. Indeed, losses have a higher value than gains. This is why people are generally loss averse;
- Loss aversion: people are more motivated to avoid losses rather than to seek gains. Therefore, the same decision might lead to different outcomes if presented as a loss avoidance or a gain seeking;
- people tend to consider probabilities in isolation rather than as a whole; this phenomenon leads people not to consider expected utility while making a decision but to consider the only alternative which would provide higher utility. Therefore, people in the same context do not take into account alternatives less likely which, if numerous, drastically distort expected utility.

Also, people tend to decide depending on the reference point considered when decision itself is taken. Prospect theory adjusts expected utility in these aspects:



Figure 2.9: Experiment on reference point

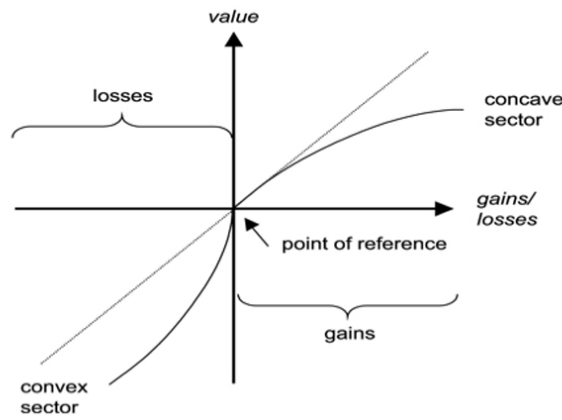


Figure 2.10: Prospect theory

- by assigning probabilities to possible scenarios, people tend to distort them with an overestimation of high probabilities and underestimation of small ones;
- there is a difference between value and utility: indeed, utility is considered only in terms of maximum achievable gain, while value takes into account both gains and losses, thus assuming either positive and negative signs respect to the reference point.

An experiment shows how people's mind works related to the reference point [33]. Such an experiment is shown in Figure 2.9. Indeed, looking at the boxes, colour perception of the inner square is influenced by the colour of the external square. The two inner squares have the same colour. However, the viewer is misled by the fact that colour brightness is not interpreted from people's eyes as independent from the context.

Figure 2.10 summarizes Kahneman and Twersky's theory. The origin is considered as the status quo point where a person must make a decision. The region of gains is concave, while losses region is convex; this explains why people are more sensitive to small changes close to status quo point. Besides, losses curve has a higher slope than gains region; therefore, the gains and the losses related to the same good (having thus the same value) has a different impact in utility, whereby having a different impact in the decision made.

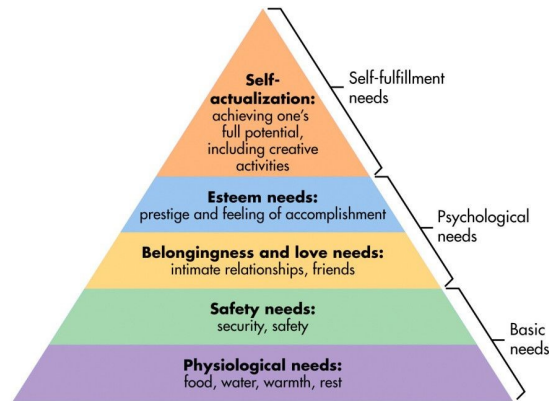


Figure 2.11: Maslow's hierarchy

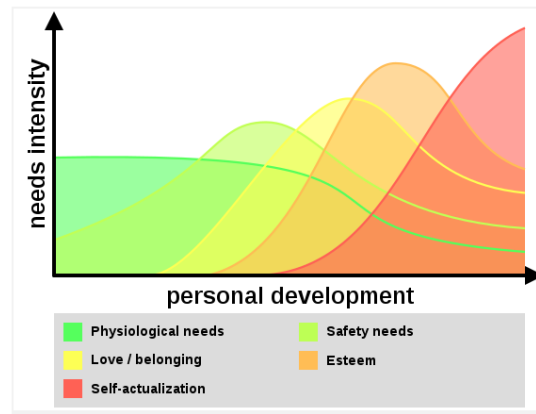


Figure 2.12: Maslow's hierarchy revisitation

2.4.2 Maslow's hierarchy of needs

Maslow's hierarchy of needs is a schematic representation which ranks human needs in sequential order. Indeed, comprehension of psychological mechanisms might explain and drive consumer behaviour [41]. According to Maslow's hierarchy, people need to satisfy different types of needs in the following order: physiological needs, the need of safety, the need of love and belonging, the need of self-esteem, the need of self-realization (see Figure 2.11). Hence, only when physiological needs are satisfied, people tend to look for safety feelings, which can be related to physical security, financial stability or protection against risks affecting health. Adults often deal with safety from an economic point of view. Therefore, safety needs are the second need people want to satisfy, thus playing a crucial role in everyday decisions. Maslow's hierarchy might be revised by taking into account that human needs motivating people are dynamic; thus, rather than a rigid hierarchy, the importance of one needs over others is temporary and depends on the context. Therefore, a more precise model puts such needs in overlapping levels, as shown in Figure 2.12, highlighting that more needs may live simultaneously.

Chapter 3

Behavioural economics in telecom services

3.1 Biases in telco customer

Consumers of telecommunication services are deeply affected by some of the cognitive biases described in the previous section. As (Akerlof et al.) suggest in their researches, if people are not able to act in their interest by making non-optimal choices, the profit opportunity will be for sure exploited by others, thus taking advantage of their irrational behaviour: "where there are fools ("phools") there are fishers ("phishers") who "pool" them" [1].

(Kenan Kalayci) provides the scientific community two studies aimed at analysing the effect of two confusion practices conducted by sellers in order to exploit buyers' non-optimal choices [35]. In the first study, the firm offers heterogeneous goods, thus highly differentiated, which lead to confusion for customers because of such differentiation; in the second study, the firm offers a standard good with multiple options which differs from one another for the complexity of price structure (multi-part tariffs). Confusopoly is a proper name for such a situation. (Carlin, 2009) highlights as follows: imagine the market is divided into two segments, one group of expert customers which buy products on the basis of price, thus more rational when asked to make a choice, and one group of uninformed customers which buy products randomly [9]. Therefore, imagining an oligopoly market, only one firm will serve the group of price-sensitive customers, while the remaining portion of demand will be split among other firms. Hence, as the number of firms competing for residual demand of uninformed customers increases, these firms will increase complexity on product offering, thus creating confusion. This works mainly for goods which do not require a substantial financial effort. Incidentally, such a description seems to fit the telecom industry perfectly. Therefore, sometimes high competition may lead to the world of Confusopoly, where uninformed customers leave money on the table because fishers are always around. Indeed, in the telecommunication industry customers face multiple and complex decisions: different kind of services (e.g. mobile, broadband, devices), different quality levels (e.g. connection quality, connection speed, connection stability), complicated pricing schemes. The results of such confusion are dual: low switching rate, because of fear and regret,

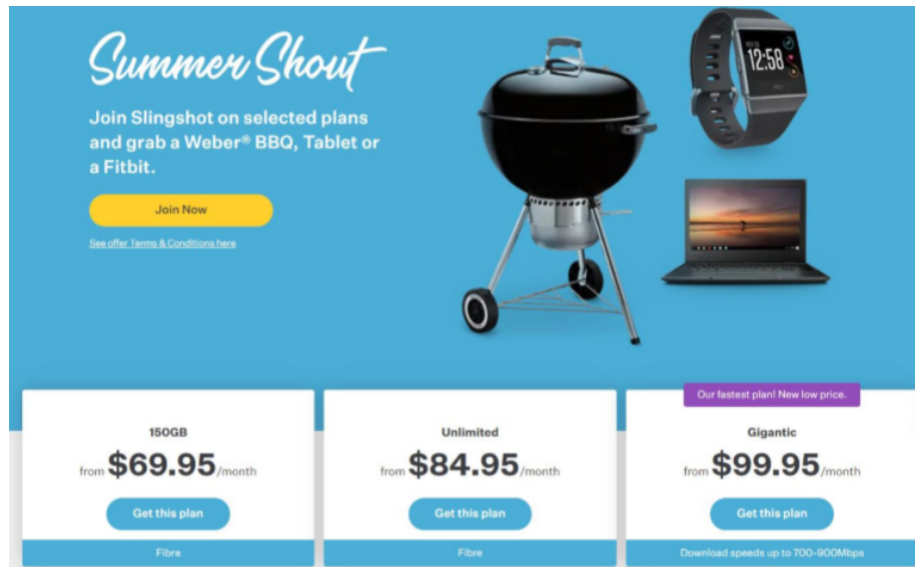


Figure 3.1: Example of present bias exploitation

and sub-optimal choices, when deciding to switch.

Here is a list of main biases customers experience when dealing with telecom products:

- **present bias:** people may be more likely to pay attention to the immediate benefits, generating immediate gratification, and be less likely to pay attention to long-term consequences. It is prevalent in the telecommunication industry that brands provide second reasons to bind customers with the contract, such as pay-tv bundles or other digital services included or discounted if bought in a bundle. However, it is difficult to identify long-term needs because it is likely that such needs will change. But people tend to rely on new functionalities or devices such as smartphones, rather than long-term costs. Very often hardware is sold in a bundle and immediately provided to the customers, which gives a sense of gratification, rather than a future switch, perceived as abstract and distant (usually two days for mobile portability and 15 days for the physical broadband switch). For instance, a bizarre offer proposed by a provider in the UK had the option of including a barbecue as part of the plan (See Figure 3.1). Present bias is also why brands usually offer promotion prices but just for the first year; therefore the starting price is always strictly lower than ending price;
- **Sunk cost fallacy:** very often customers remain in the status quo because the sunk cost they already paid is perceived as a switching cost. Examples of sunk costs are the installation cost of broadband service, the cost of the sim when changing mobile operator, the cost of the Wi-Fi modem, and so on;
- **Anchoring:** anchoring is critical regarding fundamental information, firstly the price. The exploitation of anchoring is when advertising makes prices

of basic service saliently, while it writes on the sidelines the additional costs which are mandatory in order to switch, such as installation cost, activation cost, Wi-Fi modem payment. If advertising shows the lowest possible price people anchors to, customers at least begin to evaluate whether to buy a telecommunication service, but they do so by considering not the correct price (i.e., the sum of overall costs) but the anchored price;

- **Default effect:** many activations in telecom services include multiple secondary services which are unsolicited for the majority of customers; the trick is that such services are free for the first months but a few months later are to be paid. Besides, it is minimal payments, so that customers do not even realise they are paying for those services or, if they do, they do not understand why they are paying little additional costs. Therefore, such services are not clear to customers. These services are activated by default; hence, it is on customers responsibility to deactivate them; otherwise, it is supposed to be their fault not the provider's; such practise is at least questionable;
- **IKEA effect:** for instance, if people put lots of effort into installing a broadband service, they feel about wasting their work if deciding to switch to another provider;
- **Status quo bias:** it is a primary bias in the telecom industry; therefore, a paragraph is dedicated to this behavioural problem;
- **Bandwagon effect:** it is when people are affected by other people's choice. For instance, the mobile telecommunication market is affected by network effects. Indeed, consumer's decisions in the mobile telecommunications market are affected by network effects (e.g. group or family discounted packages sold in a bundle as long as they remain altogether with the same operator);
- **Neglect of probability:** the tendency for loss aversion can affect the consumer's ability to make a rational choice when purchasing a telecommunication service. For instance, people tend to choose flat plans with more expensive packages than their actual consumption in order to feel safe. Besides, if people in the past faced a technical problem when switching to a new provider (which has a low probability of happening nowadays) they tend not to change again because they do not want to live that pain anymore, even though the probability of having another problem is very low;
- **Framing effect:** an example of the framing effect is the compromise effect. If people are offered two plans, one with lower services and price, the other with higher services and price, people would choose one among the two, depending on their utility function. However, if a third plan is added with additional services and a higher price, people that in the first scenario opted for lower tariff should still choose the first one; instead, they tend to choose the middle option, because of fear of choosing extreme options, even though the utility function is supposed to remain unchanged. Operators take advantage of such bias. "Foggy" pricing is an example: operators add a third plan that is strictly dominated by the middle option;

DataConnect Plans for:
iPad, Tablets, Camera and Gaming Devices

Data ?	Plan Charges	AT&T Wi-Fi Access ?	Domestic Overage Fees ?	Canadian Data ?	International Data ?	
DataConnect 250MB	\$14.99	✓	\$14.99 per 250 MB	\$0.015/KB	\$0.0195/KB	Add View details
DataConnect 3GB	\$30.00	✓	\$10.00 per 1 GB	\$0.015/KB	\$0.0195/KB	Add View details
DataConnect 5GB	\$50.00	✓	\$10.00 per 1 GB	\$0.015/KB	\$0.0195/KB	Add View details

5GB plan
is strictly
dominated
by 3GB

Figure 3.2: Foggy pricing

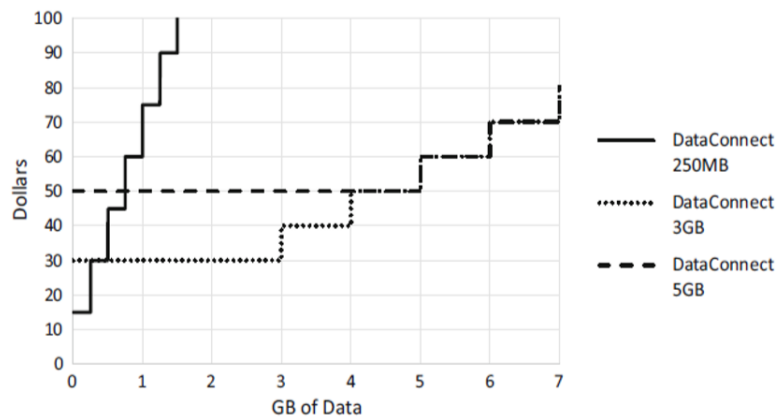


Figure 3.3: Foggy pricing

therefore, if customers are rational, their initial choice should not change. Incidentally, they do change by opting for the middle option (see Figures 3.2, 3.3);

3.2 Sticking to the status quo

Status quo is the mechanism that leads the consumer to stick to the current operator. For instance, (Turnbull et al.) highlight how mobile brands benefit from consumer confusion, whereby people tend to listen to the salesman [55]. Such a mechanism is strongly present in the telecom industry. There are three main explanations for status quo bias: rational decision making when transaction costs or uncertainty exist, cognitive misperceptions and psychological commitment.

Sometimes, sticking to the status quo is still a rational choice for the consumer. Indeed, the consumer might decide to make the same decision (that is sticking with the same operator, in the telecom case) because conditions which in the past led him to choose that operator did not change; therefore, if at

the time choosing that provider was rational, it is still rational not to switch. Furthermore, transaction costs might be higher than the potential benefit of switching supplier. Moreover, uncertainty may play a crucial role in deciding to stick to the status quo; indeed, the overall set of potential alternatives might not be known by consumer, because alternatives must be discovered, and such discovery is effortful in terms of time and costs. Hence, if research costs are higher than potential gains from moving to status quo, sticking to it is still a rational choice.

Another reason is that people tend to overweight losses and underweight gains, as demonstrated in prospect theory. As shown in Figure 2.10, the status quo represents reference point, whereby people tend to assign a higher weight to losses related to moving from the status quo and assign a lower weight to potential benefits related to such change. Therefore, because of the reference point, people are biased by the status quo. An interesting research confirms that risk aversion exists overall in both young adults and older people, but with higher impact in older people. Besides, older people are more affected by discount rates than young adults [2].

Furthermore, people are affected by sunk costs. In general, a service is provided continuously, thus consumers, even though they are not aware of it, are requested to take continuous decisions, namely sticking to status quo or moving from it. Keeping in opting for status quo operators might be caused by people willing to justify the previous time and monetary efforts (e.g., in telecoms, cost of activation, cost of Wi-Fi modem), even though those are sunk efforts, thus not affecting the cost-benefits analysis. On the contrary, it seems that younger people tend to fall in cost-sunk fallacy more than older adults [52]. Finally, people fear regret after making a choice, thus blaming themselves if they took a wrong decision while they could have stuck to the status quo. Hence, the avoidance of regret is an additional explanation of status quo bias. Indeed, consumers want to feel safe and have control over things; instead, an uncertain change may affect such control.

When the market is characterized by the presence of one big incumbent with a high relative market share, it crystallizes the status quo effect on consumer behaviour. Incumbent works in order to strengthen perceived switching costs for consumers. Indeed, the brand image of the incumbent provides consumers with better perceived overall experience.

3.3 Switching behaviour in the broadband service

Despite years from liberalisations of the telecommunication market, many consumers remain with ex-monopolist provider. This phenomenon is evident in broadband services.

In 2014 an Eurobarometer survey was conducted by the European Commission aimed at framing such situation among 28 EU States. Indeed, citizens were asked to answer the following question: "Have you or someone in your household changed service provider for the following services?". Outcomes of such analysis are shown in Figure 3.4. Looking at broadband service, the percentage of consumer who never switched to another provider ranged from almost 40%

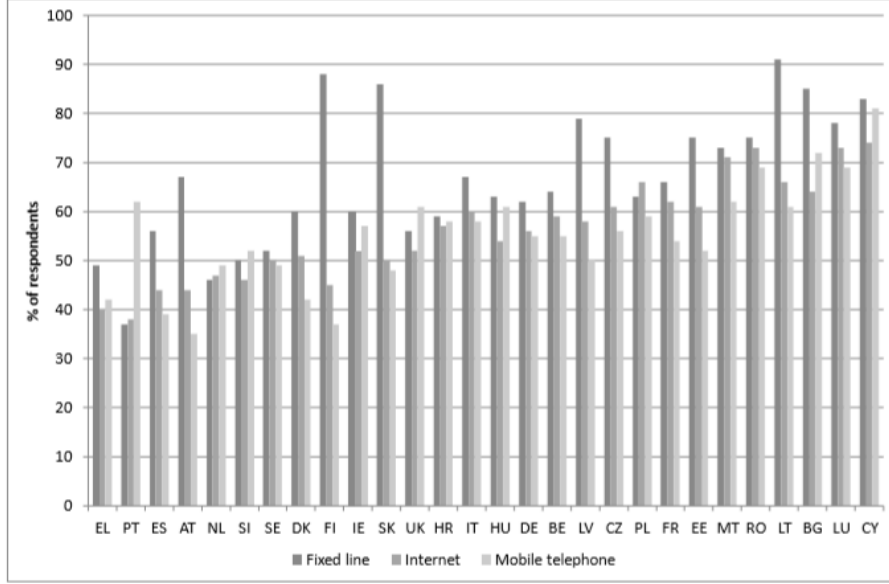


Figure 3.4: European propensity on switching telecom provider in 2014

to more than 70%. Italy stands in the middle, with a percentage equal to 60%.

Although many papers analyse switching behaviour of consumers from multiple markets, scientific literature has recently deepened determinants of consumer behaviour on switching regarding broadband provider, whether demographic, socio-economic or supplier-side ones. Main findings are presented below in order to compare them with the analysis of sales data from a Vodafone store.

3.3.1 Econometric model on switching behaviour

Burnett (2014) defined an econometric model in order to frame how consumer decide whether to switch or not a service provider [7]. However, since his model takes into account multiple services, and because the current study focuses only on broadband service, the model has been simplified. U_i^0 is defined as the utility function with the current broadband supplier of the i -th individual, while U_i^1 is the utility function of the i -th individual when choosing an alternative supplier.

$$U_i^0 = (x_i^0)' \beta^0 + z_i' \gamma^0 + \epsilon_i^0 \quad (3.1)$$

$$U_i^1 = (x_i^1)' \beta^1 + z_i' \gamma^1 + \epsilon_i^1 \quad (3.2)$$

$(x_i^0)'$ and $(x_i^1)'$ are the two vectors that contain the variables describing the profile of the subscriber, while z_i' is the vector of variables describing demographic determinants of the subscriber.

When consumer faces the choice of switching or not to another supplier's service, he takes into account net utility function, given by the difference between U_i^0 and U_i^1 minus switching cost. The latter is defined by:

$$W_i^{0 \rightarrow 1} = (x_i^0)' \beta^W 0 + (x_i^1)' \beta^W 1 + (z_i)' \gamma^W + \epsilon_i^W \quad (3.3)$$

In such equation, the switching cost is given by characteristics of the current supplier (i.e. the vector $(x_i^0)'$), characteristics of the new supplier (i.e. the vector $(x_i^1)'$) and demographic determinants (i.e. the vector $(z_i)'$) plus the error (i.e. ϵ_i^W). Hence, the net utility function is given by:

$$(NetUtility)_i = U_i k^1 - U_i k^0 - W_i k^{0 \rightarrow 1} \quad (3.4)$$

When net utility is positive, the consumer should switch. Hence, the probability of switching supplier is:

$$\begin{aligned} Prob[S_i | x_i^0, x_i^1, z_i] &= Prob[U_i^1 > (U_i^0 + W_i^{0 \rightarrow 1})] = \\ &= Prob[((x_i^1)'\beta^1 + (z_i)'\gamma^1 + \epsilon_i^1) - ((x_i^0)'\beta^0 + (z_i)'\gamma^0 + \epsilon_i^0) + \\ &\quad - ((x_i^0)'\beta^{W0} + (x_i^1)'\beta^{W1} + (z_i)'\gamma^W + \epsilon_i^W) > 0 | x_i^0, x_i^1, z_i] = \\ &= Prob[(x_i^1)'(\beta^1 - \beta^{W1}) - (x_i^0)'(\beta^0 - \beta^{W0}) + (z_i)'(\gamma^1 + \\ &\quad - \gamma^0 - \gamma^W) + (\epsilon_i^1 - \epsilon_i^0 - \epsilon_i^W) > 0 | x_i^0, x_i^1, z_i] = \\ &= Prob[(x_i^*)'\beta^* + (z_i)'\gamma^* + \epsilon_i^* > 0 | x_i^*, z_i] \end{aligned} \quad (3.5)$$

3.3.2 Literature on switching behaviour

Lunn et al. (2018)

Such paper aims at analysing the relationship between search activity for broadband switching among multiple providers and individual determinants as well as supplier characteristics. Authors do so by using a dataset from a commercial price comparison website (i.e. *Bonkers.ie*) and link them with Census data on socio-economic variables; indeed, consumers when searching in the website are requested the zip code. Hence, they link geo-coded searches with unpacked census data in order to profile average consumer characteristics on willingness to search. Notably, Small Areas (SA) in Ireland are 18,614, while researches used in the study were 72,113 [10]. In order to determine search intensity, the specification of the regression model seeks to determine the number of searches per 100 households (HH) per SA as a function of demographic and supplier factors. S_j represents the number of searches per 100 HH in the j-th SA, while I_j represents the vector of different types of internet access in the j-th SA and x_j represents the vector of socio-economic variables of j-th SA. β_1 represents the vector of socio-economic variables of j-th SA. However, also models with demographic factors alone and supplier factors alone are run.

$$S_j^* = I_j' \beta_1 + x_j' \beta_2 + \epsilon_j \quad (3.6)$$

$$S_j = \begin{cases} S_j^* : & S_j^* > 0 \\ 0 : & S_j^* \leq 0 \end{cases} \quad (3.7)$$

Notably, supplier variables include proxies for the availability of broadband and internet consumption, both representing elements of a better service, since it means high competition. Government division of broadband infrastructure in Irish territory is used for availability measure: in "dark-blue" areas commercial suppliers already provide high-speed services, in "light blue" areas such speed is not provided yet but operators aim at creating the infrastructure, in "amber" regions no operator is willing to create such infrastructure, thus forcing public intervention. Instead, Census survey on consumption is used as a proxy for broadband take-up. Finally, also population density is used as a proxy of a better service because the more people live in the same area, the more propensity operators have to create high-speed infrastructure since they reduce fixed unit cost. Regarding socio-economic variables family structure, social class, housing status and housing tenure are used in the model. Main findings are listed as follows:

- young families make 1-3.4 more searches per 100 HH than adult families;
- high social class explains high propensity to search for new tariffs; indeed, employers, managers and professionals make 2.26-3.55 additional searches per 100 HH than people belonging to non-manual class and 2.7-3.3 than manual skilled and unskilled classes;
- tenure variables have not statistical significance at explaining search behaviour; also, the model suggests that mortgage holders tend to search more for new broadband tariffs;
- areas populated by people older than 65 tend to make 8.6 fewer searches per 100 HH than areas populated by 35-44 years old people;
- areas populated by more educated HH do 4.2 more searches than areas populated by less educated HH;
- in areas where speed is low (i.e. less than 30 Mbps) the propensity to search for new tariffs is low, but the effect size is not significant;
- specification with joint variables get similar results, but with weaker significance due to collinearity among variables.

However, although the paper provides interesting findings on social-economic and supply-side factors on search intensity for new broadband services contracts, it has some limitations: indeed, it uses aggregate data related to socio-economic factors; hence, further analysis on individual factors are necessary. Furthermore, although willingness to search for new services are indeed correlated with actual switching behaviour, it is not the same thing, because people may want to look for new tariffs but not change in the end.

Lunn et al. (2017)

The authors of such paper aim at deepening consumer switching intentions linking them with socio-economic variables as well as other interesting variables related to previous people behaviour on switching. Notably, they focus on multiple services, namely broadband, landline telephony and mobile services. They do so by conducting a survey with 1,039 respondents among the Irish population.

Indeed, they asked people to answer the following question, which represents the dependent variable of the model: "How likely are you to consider switching your service provider within the next 12 months?". Possible options were: A) Not at all likely, B) Not very likely, C) Neither likely/unlikely, D) Quite likely, E) Very like. Also, they had to fill other data, representing explanatory variables, such as age, gender, employment, marital status, income, having or not children, receiving or not welfare benefits. Besides, respondents were asked the tenure of the current supplier, whether they switched operator in the past, whether they ever received a "bill shock" in the past and expected saving if they decide to switch provider [40]. Hence, the authors run a logistic regression model in order to explain the switching intention likelihood of survey respondents. Main findings regarding broadband service are listed as follows:

- people who never changed provider or who had not in the previous three years are significantly less likely to have switching intentions;
- receiving a "bill shock" in the past has a strong correlation with the intention of switching provider;
- respondents expecting high saving if changing provider are those with higher switching intentions;
- respondents having children are less likely to want to change provider;
- respondents older than 55 are more likely to switch operator, while retired people are less likely;
- other socio-economic determinants do not have statistical significance (e.g. income, marital status).

Such study has a substantial limitation: indeed, it deals with people intention on switching rather than on actual switching behaviour, because the two may converge but also diverge. Hence, new studies on actual switching behaviour are necessary to deepen such issue.

Burnett (2014)

The paper aims at analysing how demographic determinants impact consumer behaviour on switching provider in more home services, namely broadband internet, pay-TV, landline telephones and mobile telephones. Only results from broadband service have been taken into account. The author used a survey-elicited dataset of 2,871 individuals, commissioned by *Ofcom*, the UK communications regulator [7]. Indeed, it has been conducted a probit model by comparing demographic-based models with the supplier-based model. Hence, people's willingness to change service provider is a function of different variables, coming from service quality and individual characteristics: indeed, the switching function depends on service, bundle, duration, supplier, income, employment, children, education, gender and age variables. Three models are tested to predict determinants that might have statistical significance regarding switching likelihood. The first model takes into account only demographic variables, while the second model only service and supplier variables. Finally, the third model combines both types of variable, described by the following specification:

$$\begin{aligned}
S_{ik} = & \alpha + TV_{ik}^{[0,1]} \left(\beta_{TV,0} + \sum_{\beta_{TV,1}}^{\beta_{TV,6}} SUPPLIER_{ik}^* + \beta_{TV,7} Bundled_{ik}^{[0,1]} + \right. \\
& + \sum_{\beta_{TV,8}}^{\beta_{TV,13}} DURATION_{ik}^* \left. \right) + BB_{ik}^{[0,1]} \left(\beta_{BB,0} + \sum_{\beta_{BB,1}}^{\beta_{BB,6}} SUPPLIER_{ik}^* + \right. \\
& + \beta_{BB,7} Bundled_{ik}^{[0,1]} + \sum_{\beta_{BB,8}}^{\beta_{BB,13}} DURATION_{ik}^* \left. \right) + Mob_{ik}^{[0,1]} \left(\beta_{Mob,0} + \right. \\
& + \sum_{\beta_{Mob,1}}^{\beta_{Mob,6}} SUPPLIER_{ik}^* + \beta_{Mob,7} Bundled_{ik}^{[0,1]} + \sum_{\beta_{Mob,8}}^{\beta_{Mob,13}} DURATION_{ik}^* \left. \right) + \\
& + LL_{ik}^{[0,1]} \left(\beta_{LL,0} + \sum_{\beta_{LL,1}}^{\beta_{LL,6}} SUPPLIER_{ik}^* + \beta_{LL,7} Bundled_{ik}^{[0,1]} + \right. \\
& + \sum_{\beta_{LL,8}}^{\beta_{LL,13}} DURATION_{ik}^* \left. \right) + BT_{ik}^{[0 \rightarrow 1]} \left(\beta_{BT,14} + \beta_{BT,15} Bundle_{ik}^{0 \rightarrow 1} + \right. \\
& + \sum_{\beta_{BT,16}}^{\beta_{BT,31}} DURATION_{ik}^* \left. \right) + Sky_{ik}^{[0 \rightarrow 1]} \left(\beta_{Sky,14} + \beta_{Sky,15} Bundle_{ik}^{0 \rightarrow 1} + \right. \\
& + \sum_{\beta_{Sky,16}}^{\beta_{Sky,31}} DURATION_{ik}^* \left. \right) + Talk_{ik}^{[0 \rightarrow 1]} \left(\beta_{Talk,14} + \beta_{Talk,15} Bundle_{ik}^{0 \rightarrow 1} + \right. \\
& + \sum_{\beta_{Talk,16}}^{\beta_{Talk,31}} DURATION_{ik}^* \left. \right) + Virg_{ik}^{[0 \rightarrow 1]} \left(\beta_{Virg,14} + \beta_{Virg,15} Bundle_{ik}^{0 \rightarrow 1} + \right. \\
& + \sum_{\beta_{Virg,16}}^{\beta_{Virg,31}} DURATION_{ik}^* \left. \right) + MobFirm_{ik}^{[0 \rightarrow 1]} \left(\beta_{MobFirm,14} + \right. \\
& + \beta_{MobFirm,15} Bundle_{ik}^{[0 \rightarrow 1]} + \sum_{\beta_{MobFirm,16}}^{\beta_{MobFirm,31}} DURATION_{ik}^* \left. \right) + \\
& + Other_{ik}^{[0 \rightarrow 1]} \left(\beta_{Other,14} + \beta_{Other,15} Bundle_{ik}^{[0 \rightarrow 1]} + \sum_{\beta_{Other,16}}^{\beta_{Other,31}} DURATION_{ik}^* \right) + \\
& + Bundle_{ik}^{[0 \rightarrow 1]} \left(\beta_{22} + \sum_{\beta_{23}}^{\beta_{28}} DURATION_{ik}^* \right) + \sum_{\beta_{29}}^{\beta_{34}} DURATION_{ik}^* + \\
& + \sum_{\gamma_1}^{\gamma_7} INCOME_i^* + \gamma_8 Children_i^{[0 \rightarrow 1]} + \sum_{\gamma_9}^{\gamma_{15}} EMPLOYMENT_i^* + \\
& + \gamma_{16} Gender_i^{[0 \rightarrow 1]} + \sum_{\gamma_{17}}^{\gamma_{21}} EDUCATION_i^* + \sum_{\gamma_{22}}^{\gamma_{29}} AGE_i^* + u_i + \epsilon_{ik}
\end{aligned} \tag{3.8}$$

Main findings are listed below:

- model using service and supplier variables better predict consumer likelihood of switching service operator than the model using individual demographic characteristics;
- the model suggests that people older than 75 are less likely to switch provider;
- there is a non-linear relationship between income and switching behaviour; indeed, individuals earning within the range of £17,500 and £49,999 are more likely to switch operator than individuals earning less than £17,500 or more than £50,000. However, in the joint specification, such significance is present in the range of £17,500-£29,999 income;
- if individuals have children, they are less likely to switch operator (i.e. negative impact of 5%), while its effect increases in the joint specification (i.e. -10%);
- there is no significance in the relationship between the likelihood of switching and employment categories;
- again, there is no significant difference between male and female behaviour on switching service provider;
- there is a non-linear relationship between switching behaviour and education, whereby middle categories are more likely to switch operator; this might be due to higher perceived risk in less skilled people and higher cost of time in more educated people; indeed, because education is strongly correlated to income, also income has a similar trend;
- when the duration of the contract is short (lower than six months) or too long (more than two years) the consumer is less likely to switch operator; in the former case it is probably due to a recent switching, so it is not necessary to look the market again, while in the latter case it might be due to lack of attention, status quo and inertia or low competition in the area;
- when firms bundle their services, consumers are less likely to switch operator.

However, although the paper provides interesting findings on switching behaviour, it does so by putting together multiple services, thus potentially biasing consumer behaviour on individual service. Indeed, it predicts consumer intrinsic willingness to switch service provider among overall services, thus independently from individual service. It provides insights on intrinsic people behaviour; however, it might bias the analysis of switching behaviour likelihood related to individual services.

Other papers

Here is a list of main findings from other papers dealing with switching behaviour related to broadband service:

- De los Santos (2018) finds that broadband users seem to be more likely to search for new tariffs when belonging to 30-34 and 55-64 age range. Besides, consumers belonging to high-income classes have a lower propensity to search for new tariffs. Again, the propensity to search is correlated but not equal to actual switching behaviour [12];
- Waddams Price and Zhu (2016) through a survey among English respondents gather information on search propensity and actual switching behaviour in different markets, among which broadband service. They evidence that switching intention and switching behaviour are related with a U-shape curve with age, meaning that middle-age individuals are less likely to search and to switch broadband provider. Besides, people belonging to high-income categories seem to switch less, probably due to a high cost of time. Finally, males are shown to be less likely to search or to switch provider compared to female individuals; instead, there is no significant difference in behaviour when dealing with education categories [60]; however, the main limitation of the study lies in the fact that respondents had to respond to survey questions, thus possibly biasing answers; a second limitation is that the model puts together variables from different markets, without considering models for each market separately;
- Conversely to Waddams Price and Zhu (2016) findings, Gamble et al. (2009) show that male has higher propensity on switching broadband service than female individuals [25];
- Multiple studies evidence a negative relationship between switching behaviour and individual's age (e.g. Burnett (2014) [7], Lopez, Redondo, & Oliván (2006) [39]);
- More studies do not find a relationship between education levels and switching behaviour, namely Giulietti et al. (2005) [27], Waddams Price & Zhu (2016) [60], Gamble et al. (2009) [25];
- Xavier (2011) highlights that "bill shock" represents an important driver triggering consumer's willingness to switch provider [62];

3.4 Bundle

With bundling, firms put together two different products and/or services by generating a package to gain a price advantage. Conditions for such situations are:

- Heterogeneous consumers;
- Price discrimination is not possible;
- Demands of the two products are negatively correlated

By looking at Figure 3.5 there are four different scenarios when products are unbundled, depending on the comparison between reservation price and selling price of the two goods:

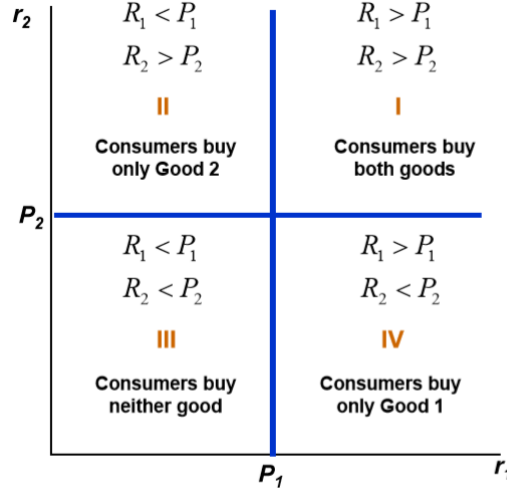


Figure 3.5: Unbundled products

1. Consumers buy both goods;
2. Consumers buy only good 2;
3. Consumers buy neither good;
4. Consumers buy only good 1.

Instead, by looking at Figure 3.6, where products are sold in a bundle, scenarios partially differ: indeed, if combined reservation price is higher than the price of the bundle, then consumers will buy the bundle, while if it is low, they won't. However, the portion of demand which would have bought only one of the two good, might decide to buy the bundle, including the good they would not have bought because the overall net utility is still positive. This way, firms manage to extract part of consumers' surplus.

Mixed bundle refers to two or more products which are sold both individually and in a bundle. This is the case of the majority of bundles among telecommunication services. Indeed, almost all operators offer mobile plus broadband or mobile plus smartphone or broadband plus TV digital platforms (e.g. Netflix) as a mixed bundle.

Not necessarily bundle services negatively affect consumer utility or are offered by the firm to trick them. However, looking at all possible scenarios is necessary in order to understand the perspectives of firms, consumers and regulator. In the case of mixed-bundle, if the consumer is rational, he would buy two services sold in a bundle only if the overall price is lower than the sum of the prices of the services sold individually, plus if the absolute net utility is higher with the bundle.

In favour of bundles, there is the fact that if two goods are complementary, then buying them in bundle generates one single transaction while buying them individually would generate two different transactions, thus duplicating efforts for two complementary products. If transaction costs exist, even though the bundle price is equal to the sum of individual prices, consumers should have

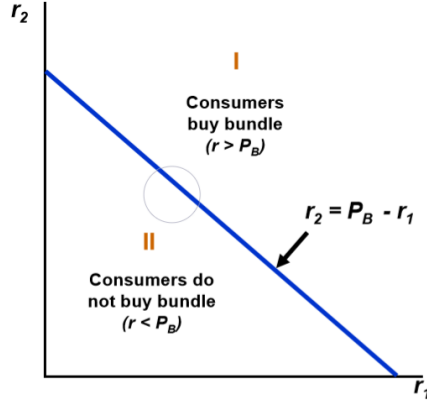


Figure 3.6: Bundled products

higher net utility with bundle services, because they would avoid duplication of transaction costs.

However, consumers tend to over-emphasise the value of singular products rather than looking at the overall value of bundle; therefore, firms try to offer highly salient features of the overall bundle, nudging consumers to look at the bundle and not at two separate products forced to be sold in a bundle; besides, they discount the purchase of bundle over individual purchases. Such a problem is predominant in markets where people expect the majority of products sold in bundle offers, such as telecommunication services. Indeed, telecommunication markets are flooded with products and services sold as mixed-bundled. Furthermore, bundles might reduce consumer risk aversion towards telecommunication services, in particular for those consumers who rationally would buy two products separately, but do not do it because of risk aversion; in such case, they might buy bundle services because overall price should be reduced, thus increasing their surplus.

Information made salient is critical for consumer's choice. However, the consumers might not be provided with correct or precise information, thus biasing their decision. Indeed, it often happens that they buy unsolicited services, most of the times without being aware of it, especially if put as default option during activation. In such a case, the additional service needs to be deactivated by the consumer after the activation; the trick is that such small additional services are not so expensive but do not increase the utility of the average consumer. It usually happens that such services are free for the first period. Therefore, people might not be aware of such services for an extended period or, if they are, they might forget to deactivate them.

Literature has deepened whether currently having more telecom services provided in a bundle might affect consumer propensity to search for new tariffs and making an actual switch of the service provider. Almost all papers show that consumers having telecom services sold in a bundle are less likely to switch provider because of long contract binding them to remain with the bundle for a given period; a second reason is the difficulty in comparing bundles service with individually sold services (Xavier (2008) [63], Burnett (2014) [7], Xavier and Ypsilanti (2008) [63], Prince and Greenstein (2014) [46]). Conversely, for Lunn

et al. (2017) individuals being paying for bundles services have higher search intensity for new tariffs; however, looking for new plans does not mean actual provider switch, but could mean higher willingness to switch because provider exploits the binding of the contract.

3.5 Data analysis from Vodafone’s sales

One of the limitations of papers previously presented is the indirect representation of the dependent variable, namely switching behaviour; indeed, some papers use proxies to determine switching variables. However, such proxies hide some limitations. For instance, directly asking people about their intention of switching broadband service is dangerous, because it is difficult to explain a behavioural, thus partially or entirely unconscious, phenomenon at the same time assuming they fill the survey with rational thinking. Moreover, it is doubtful to use one function for switching behaviour by utilising multiple variables coming from different markets in order to determine people intrinsic switching behaviour, as if switching behaviour would not be different for individual markets. Finally, no paper deepens incumbent bias as one of the main determinants of switching behaviours among multiple variables that may explain consumer actual switching behaviour regarding broadband service. Hence, such study aims at providing scientific literature new insights on switching behaviour related to telecom services. However, such study has some limitations, that will be highlighted later.

3.5.1 Model specification

Dataset presentation

From the beginning of the collaboration with Vodafone, a principal leader in the international telecom scene, data from people entering a Sardinian Vodafone store have been gathered in order to create a dataset. Precisely, data refers to individuals from the 13th of January to the 21st of February 2020. Considering that the store was open five days per week, it was possible to gather 939 observations, with average daily entrances of 31.3. To be noted that all individuals entering the store were proposed to switch to Vodafone broadband service; indeed, broadband is deemed the golden mine where to gain higher profits either for retailers and for telcos among telecom services. However, observations eligible for the study almost halved; indeed, while no issues on collecting data arose when dealing with consumers who decided to switch to Vodafone broadband service (because such data were mandatory), some people who did not switch did not want to provide them, (probably due to lack of time or unwillingness to give such information). Hence, 465 observations have been used in the study.

Independent and dependent variable

The primary objective is to determine whether consumers are biased by the presence of the leading incumbent when dealing with the choice of switching provider for broadband service. It has been run a regression analysis by using switching behaviour concerning demographic determinants and supplier-side factors. Indeed, gender and age information could be easily gathered from

Variable	Obs	Mean	Std. Dev.	Min	Max
male	465	.5075269	.5004818	0	1
age18to34	465	.172043	.3778243	0	1
age35to54	465	.4064516	.4916997	0	1
age55to64	465	.1698925	.3759428	0	1
ageover65	465	.2516129	.4344073	0	1
bundleTV	465	.0236559	.1521384	0	1
broadband	465	.1505376	.3579828	0	1
incumbent	465	.4709677	.499694	0	1

Figure 3.7: Descriptive statistics: binary variables

individuals, while about supplier-side factors, two main determinants have been selected: the current provider of broadband supplier and the contextual selection of bundle products in case individuals decided to switch to Vodafone's broadband. Specifically, Vodafone proposes a mixed bundle of broadband service and Vodafone TV, which is a hardware device that enables old TV to become smart TV; besides, it includes a package of media services from NOW TV, Infinity and Chili. However, Vodafone TV service can be bought only in a bundle and not alone, while broadband service can be bought separately from Vodafone TV.

The dependent variable is *switching behaviour*, which is a binary variable because it describes whether an individual decided or not to switch to Vodafone broadband service when proposed. Instead, explanatory variables are:

- *Male*, a binary variable equal to 1 if individual is male and to 0 conversely;
- *Age*, a categorical variable, meaning that individual belong to 18 – 34, 35 – 54, 55 – 64 or 65+ age category; in order to create the regression model, a binary variable has been created for each age category;
- *Incumbent*, a binary variable equal to 1 if individual's current broadband supplier is the market incumbent, namely Tim-Telecom, and to 0 conversely;
- *BundleTV*, equal to 1 in case the consumer who decided to switch to Vodafone broadband service opted for Vodafone TV bundle too.

Figure 3.7 shows descriptive statistics from Vodafone's dataset used in the analysis. To be noted that, since all variables are binary, such statistics are to be interpreted in percentage terms.

Estimation method

Given Vodafone's dataset, it is possible to determine the switching function as follows:

$$function(S) = S(Gender, Age, BundleTV, Incumbent) \quad (3.9)$$

However, since the dependent variable is binary, logistic regression has been used in the model specification. Also explanatory variables are binary. Therefore, the analysis aims to provide a function of the likelihood of switching given

explanatory variables. The probability function is a logistic function, which is a Sigmoid curve. Three specifications have been run:

1. explanatory variables are only demographic, (i.e., *male* and *age*);
2. explanatory variables are only supplier-side (i.e., *Incumbent* and *BundleTV*);
3. explanatory variables are both demographic and supplier-side as a joint specification.

First specification Specification of the first model through the log of odds function is a linear function, described below, considering only demographic variables, where p stands for the probability of switching broadband provider of the sample under analysis:

$$\begin{aligned} \log(ODDS_i) = \log\left(\frac{p_i}{1-p_i}\right) = & \beta_0^{(1)} + \beta_1^{(1)}male_i + \beta_2^{(1)}age18to34_i + \beta_3^{(1)}age35to54_i + \\ & + \beta_4^{(1)}age55to64_i + \beta_5^{(1)}ageover65_i + \epsilon_i^{(1)} \end{aligned} \quad (3.10)$$

Once computed coefficients of the linearised logistic function, it is possible to compute the effect of the coefficients of variables, as shown in the following equation:

$$p_i = \frac{e^{\beta_0^{(1)} + \beta_1^{(1)}male_i + \beta_2^{(1)}age18to34_i + \beta_3^{(1)}age35to54_i + \beta_4^{(1)}age55to64_i + \beta_5^{(1)}ageover65_i}}{1 + e^{\beta_0^{(1)} + \beta_1^{(1)}male_i + \beta_2^{(1)}age18to34_i + \beta_3^{(1)}age35to54_i + \beta_4^{(1)}age55to64_i + \beta_5^{(1)}ageover65_i}} \quad (3.11)$$

Second specification Specification of the second model through the log of odds function is a linear function, described below, considering only supplier-side variables, where p stands for the probability of switching broadband provider of the sample under analysis:

$$\log(ODDS_i) = \log\left(\frac{p_i}{1-p_i}\right) = \beta_0^{(2)} + \beta_1^{(2)}incumbent_i + \beta_2^{(2)}bundleTV_i + \epsilon_i^{(2)} \quad (3.12)$$

once computed coefficients of the linearised logistic function, it is possible to compute the effect of the coefficients of variables, as shown in the following equation:

$$p_i = \frac{e^{\beta_0^{(2)} + \beta_1^{(2)}incumbent_i + \beta_2^{(2)}bundleTV_i}}{1 + e^{\beta_0^{(2)} + \beta_1^{(2)}incumbent_i + \beta_2^{(2)}bundleTV_i}} \quad (3.13)$$

Third specification Specification of the third model through the log of odds function is a linear function, described below, considering both demographic and supplier-side variables, where p stands for the probability of switching broadband provider of the sample under analysis:

Logistic regression	Number of obs	=	465
	LR chi2(4)	=	1.06
	Prob > chi2	=	0.9012
Log likelihood = -196.46485	Pseudo R2	=	0.0027

broadband	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
male	.0993694	.2600724	0.38	0.702	-.410363	.6091019
age18to34	-.1949264	.410235	-0.48	0.635	-.9989723	.6091195
age35to54	-.1974496	.3278798	-0.60	0.547	-.8400822	.4451831
age55to64	.1029251	.3869564	0.27	0.790	-.6554956	.8613457
ageover65	0 (omitted)					
_cons	-1.690622	.2839403	-5.95	0.000	-2.247135	-1.134109

Figure 3.8: Results of the first model

Logistic regression	Number of obs	=	454
	LR chi2(1)	=	13.69
	Prob > chi2	=	0.0002
Log likelihood = -168.53848	Pseudo R2	=	0.0390

broadband	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
incumbent	-1.101457	.3154713	-3.49	0.000	-1.71977	-.4831448
bundleTV	0	(omitted)				
_cons	-1.48881	.1668996	-8.92	0.000	-1.815927	-1.161693

Figure 3.9: Results of the second model

$$\begin{aligned} \log(ODDS_i) = \log\left(\frac{p_i}{1-p_i}\right) = & \beta_0^{(3)} + \beta_1^{(3)} male_i + \beta_2^{(3)} age18to34_i + \\ & + \beta_3^{(3)} age35to54_i + \beta_4^{(3)} age55to64_i + \beta_5^{(3)} ageover65_i + \\ & + \beta_6^{(3)} incumbent_i + \beta_7^{(3)} bundleTV_i + \epsilon_i^{(3)} \end{aligned} \quad (3.14)$$

Once computed coefficients of the linearised logistic function, it is possible to compute the effect of the coefficients of variables, as shown in the following equation:

$$p = \frac{e^{\log(ODDS_i)}}{1 + e^{\log(ODDS_i)}} \quad (3.15)$$

3.5.2 Results and discussion

After running such models by using Stata software, results of the first, second and third specification are shown in Figures 3.8, 3.9 and 3.10 respectively.

By looking at the first specification's results, the difference between male and female consumers has an effect size equal to 0%, plus the coefficient is not statistically significant. Such a result confirms the main findings among

Logistic regression

Number of obs = 454

LR chi2(5) = 15.48

Prob > chi2 = 0.0085

Pseudo R2 = 0.0441

Log likelihood = -167.64262

broadband	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
male	-.0307523	.2849413	-0.11	0.914	-.5892269	.5277223
age18to34	-.3178871	.4439713	-0.72	0.474	-1.188055	.5522807
age35to54	-.314222	.3510621	-0.90	0.371	-1.002291	.3738471
age55to64	.1458575	.4272335	0.34	0.733	-.6915049	.9832198
ageover65	0 (omitted)					
incumbent	-1.135428	.3202945	-3.54	0.000	-1.763194	-.5076627
bundleTV	0 (omitted)					
_cons	-1.313439	.3079028	-4.27	0.000	-1.916917	-.7099602

Figure 3.10: Results of the third model

literature where differences in gender determinant have been hardly found. It seems that, nowadays, the gender gap does not exist anymore even in decision making regarding utilities; indeed, in the past, it was often the man of the household having decisional power on such issues. When looking, instead, at age determinant, again it is not statistically significant; moreover, differences in terms of effect size are not that important, since the likelihood of switching to a new broadband provider of people belonging to 18-34, 35-54, 55-64 and over65 years old is respectively equal to 12.61%, 12.58%, 16.27% and 14.92%. Such finding contrasts main findings in the literature on switching behaviour related to age factor, in which older individuals are less likely to switch; this may be because people entering an offline store are usually older than average population. Indeed, younger people might decide to switch to an alternative provider through operators' call centres or directly through online websites. If this is true, age differences would still hold.

By looking at the second specification's results, having a contract with the leading incumbent in the market (i.e. Tim-Telecom in the case study) reduces the likelihood of switching provider by 11.5 percentage points (from 18.4% to 6.9%), with a strong statistical significance, far lower than 0.05. Such finding demonstrates that the supply side might actively alter demand behaviour in decision making. In such a specification pseudo-R-squared is 0.039. Instead, in the third specification, where both demographic and supplier-side determinants have been taken into account, pseudo-R-squared is equal to 0.0441. Here, coefficients related to *Incumbent* variable does not undergo a substantial changing, as well as statistical significance. Besides, the fourth specification considers also potential joint effects of all variables, but all additional variables have a small effect size plus a very high p-value; however, pseudo-R-squared reaches 0.0519. Therefore, adding such variables results as useless. Indeed, the aim of the research is not to find overall possible determinants on switching behaviour, which would make pseudo R-squared rise to a high value, but to find new determinants on switching behaviour that are statistically significant.

Therefore, the presence of the incumbent is an important factor influencing consumer decision making. It seems that broadband market is split into two

Logistic regression

Log likelihood = -161.45442

Number of obs = 419

LR chi2(11) = 17.68

Prob > chi2 = 0.0892

Pseudo R2 = 0.0519

broadband	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
male	.5388915	.5630954	0.96	0.339	-.5647552	1.642538
age18to34	.495941	.6496839	0.76	0.445	-.777416	1.769298
age35to54	-.6262805	.6240518	-1.00	0.316	-1.8494	.5968385
age55to64	.9804149	.7658224	1.28	0.200	-.5205694	2.481399
ageover65	0	(omitted)				
incumbent	-.5160189	.6833912	-0.76	0.450	-1.855441	.8234032
bundleTV	0	(omitted)				
maleincumbent	-1.123573	.7200432	-1.56	0.119	-2.534831	.2876861
age18to34male	-.9956499	.9676646	-1.03	0.304	-2.892238	.9009378
age35to54male	.1099612	.7326047	0.15	0.881	-1.325918	1.54584
age55to64male	-1.008702	.9379614	-1.08	0.282	-2.847072	.829669
ageover65male	0	(omitted)				
age18to34inc	0	(omitted)				
age35to54inc	.7494825	.7944516	0.94	0.345	-.807614	2.306579
age55to64inc	-1.090353	1.033416	-1.06	0.291	-3.115811	.9351055
ageover65inc	0	(omitted)				
_cons	-1.648621	.4503231	-3.66	0.000	-2.531238	-.7660035

Figure 3.11: Results for additional model

main segments: one segment is relatively competitive and is characterised by consumers who have less difficulty in switching provider, while a second segment has a lower propensity over switching provider. It seems that the incumbent is mainly present in the segment where people do not switch very often. Tim takes advantage of such polarisation, given by its brand equity, thanks to the fact that it is unsurprisingly the ex-monopolist of the market. Such finding is consistent with the survey conducted in 2014 by the European Commission, where, depending on the country, from 40% to 70% of European consumers never switched internet provider. A possible explanation is the *incumbent bias*.

To be noted that one of the age variables, namely *over65*, has been dropped because of perfect collinearity with other age variables. Furthermore, the variable representing the bundle of broadband service with TV product/service has been dropped too; indeed, although it would be an interesting factor partially explaining switching behaviour of consumers, it cannot be taken into account in the model. Since consumers can buy Vodafone TV only in a bundle with the broadband service (but not vice versa), *BundleTV* variable is strongly collinear with the dependent variable and, because in order to run a logistic regression low degree between explanatory and dependent variables is required, the software drops such variable from the analysis. This does not mean it is not a variable potentially explaining behaviour on switching. Indeed, if it was possible to buy Vodafone TV separately from broadband service, it could have been considered in the analysis. To be noted that out of 70 people switching broadband service, 11 opted for a mixed bundle, equal to 15.71%.

3.5.3 Limitations of the study

The study has highlighted the presence of another variable which helps to explain consumer behaviour on switching broadband supplier, namely incumbent bias. However, like most of the studies, it has some limitations.

The first is a low level of pseudo-R-squared value (i.e. 0.039). Indeed, the R-squared is deemed to be the first measure scientific community tend to look at when running regression models. This is particularly true in studies attempting to explain exact prediction, such as machine learning models or pure science models; indeed, in these contexts, a high R-squared, meaning a good fit of the model with data, is the primary goal of the analysis. Instead, when a study aims at finding a potential relationship between two variables, a high R-squared is a secondary goal; indeed, the primary goal is to find coefficients that are strongly statistically significant. Especially in social sciences, a low value of R-squared is standard, since there is a multitude of variables explaining the dependent variable. Therefore, in order to boost the R-squared, all possible variables should be taken into account; however, since the individual contribution of each variable in increasing R-squared would be marginal, too many variables should be used. In the case study under analysis switching behaviour is plenty of possible explanatory variables (e.g. gender, age, income, incumbent, having Vodafone mobile tariff, price, having switched other times in the past, receiving a shocking bill). The paper aims at providing an additional variable to consider. Furthermore, given the fact that scientific community is biased by R-squared "mantra", in logistic regression pure R-squared measurement does not have any sense; however, in logistic regression multiple other measures have been created, which has nothing in common with R-squared of linear regression. Indeed, Pseudo-R-squared compares the maximum log-likelihood of the model with that of a null model, where only the intercept is considered.

Another potential limitation is that *incumbent* variable and *switching* variable do not have a casual relationship, but it is, instead, an association, because *incumbent* variable might be related to another variable which explains dependent variable. Indeed, people having a contract with incumbent may live in areas where only or mainly the incumbent infrastructure is present; in such case their choice on sticking with the incumbent brand is not due to the *incumbent bias* but by a low degree of supply, forcing them to choose the service of the incumbent. However, in *Sassari*, more than one supplier is available almost everywhere.

Additionally, data of the study come only from offline consumers; it does not consider online switching behaviour. Indeed, because younger people usually make online activations, the non-statistical significance of the model regarding the age of individuals might be justified by the fact the many young people activate their broadband services through websites and call centres of telcos. If this is true, awareness among the scientific community that older people are less likely to switch provider would be still respected. Moreover, people who decided not to provide information may belong not to a random sample but may have some characteristics, whose absence altered the model.

A final potential limitation is that only consumer who had to decide whether to switch from their current provider to Vodafone have been considered. Because Vodafone has its characteristics, the same choice made with other brands may differ.

Chapter 4

BASIC

4.1 BASIC toolkit

"*BASIC - The Behavioural Insights Toolkit and Ethical Guidelines*" is a tool developed by *OECD* aiming to provide a simple but effective framework to policymakers willing to apply behavioural insights to solve a public policy issue [29]. It is a powerful tool because of its ease of use and its pragmatism, thus suitable even for practitioners; it provides a standard methodology to develop the best possible strategy to solve a specific policy problem and to assess if the intervention worked. Indeed, a standard approach helps the scientific community to comply, whereby all the results can be compared more effectively. Moreover, although behavioural insights might not seem a rocket science, instead it hides pitfalls practitioners risk to encounter if not adequately prepared.

In particular, it wants to answer the following questions: How to work effectively and systematically in applying BI for policy design? How to work in this direction by maximizing the citizen's protection from the potential threat of incorrect application or incorrect use of BI? Therefore, it does not only help to develop a strategy that produces desired results but also to avoid mistakes in policy design with the risk of getting to wrong conclusions and causing avoidable expenses in the wrong strategy.

The BASIC toolkit is structured in five sequential steps:

- **Behaviour:** it aims to frame the crucial issue from the public policy point of view taking into account different factors, such as the intrinsic problem itself, then political, institutional and policy context, and finally domain constraints within which to work;
- **Analysis:** given the selected problem, it aims to analyse in depth all the relevant aspects of the target problem looking at it from a behavioural point of view;
- **Strategies:** it deals with developing an effective strategy to intervene in order to change the target behaviour as policymaker would like to; it uses a conceptualized model to design the best strategy of intervention systematically;

- **Intervention:** it designs an experiment about the strategy implementation to solve the target problem and evaluated ex-post whether the intervention has been successful or unsuccessful;
- **Change:** in case the intervention worked, it plans the implementation of the experiment and its scalability at institutional, political and policy levels.

It is critical to highlight the importance of constraints policymakers might face (e.g. resources, time, budget); indeed, practitioners willing to apply *BASIC* tool need to ponder the feasibility of every step in order to develop a successful experiment. Furthermore, context matters throughout the stages, so policy designers should consider all these variables to maximize the quality of behavioural insights. A primary overview of *BASIC* toolkit steps is shown in Figure 4.1.

4.1.1 Behaviour

This is the first step of behavioural insights project. Hence, the *Behaviour* step is made of:

1. Decomposing the policy problem through a behavioural reduction;
2. Prioritizing behaviours to be included in the behavioural insights project;
3. Describing potential behaviours using behavioural maps;
4. Identify behaviours with the best potential for a behavioural approach.

Throughout these steps, practitioners explore and scope all the behaviours eligible for the scope of the project. Furthermore, it helps practitioners to think harder on the behaviours concerning the policy problem they are willing to analyse and find a solution to. Therefore, the *Behaviour* step is either a divergent and convergent step because it starts exploring the behavioural level and then it selects the target problem according to the defined criteria.

Before putting hands on the problem, practitioners should think about the following questions:

- Problem definition: what is the problem? What is behavioural and what is not?
- Key object: what is the object policy maker is willing to achieve?
- Data: which data and information are necessary? Can them be collected? If yes, how?
- Options: which are the potential solutions and at what level (institutional, systemic, individual)?
- Impact: which are the potential impacts? How can these be measured and evaluated by using behavioural insights?

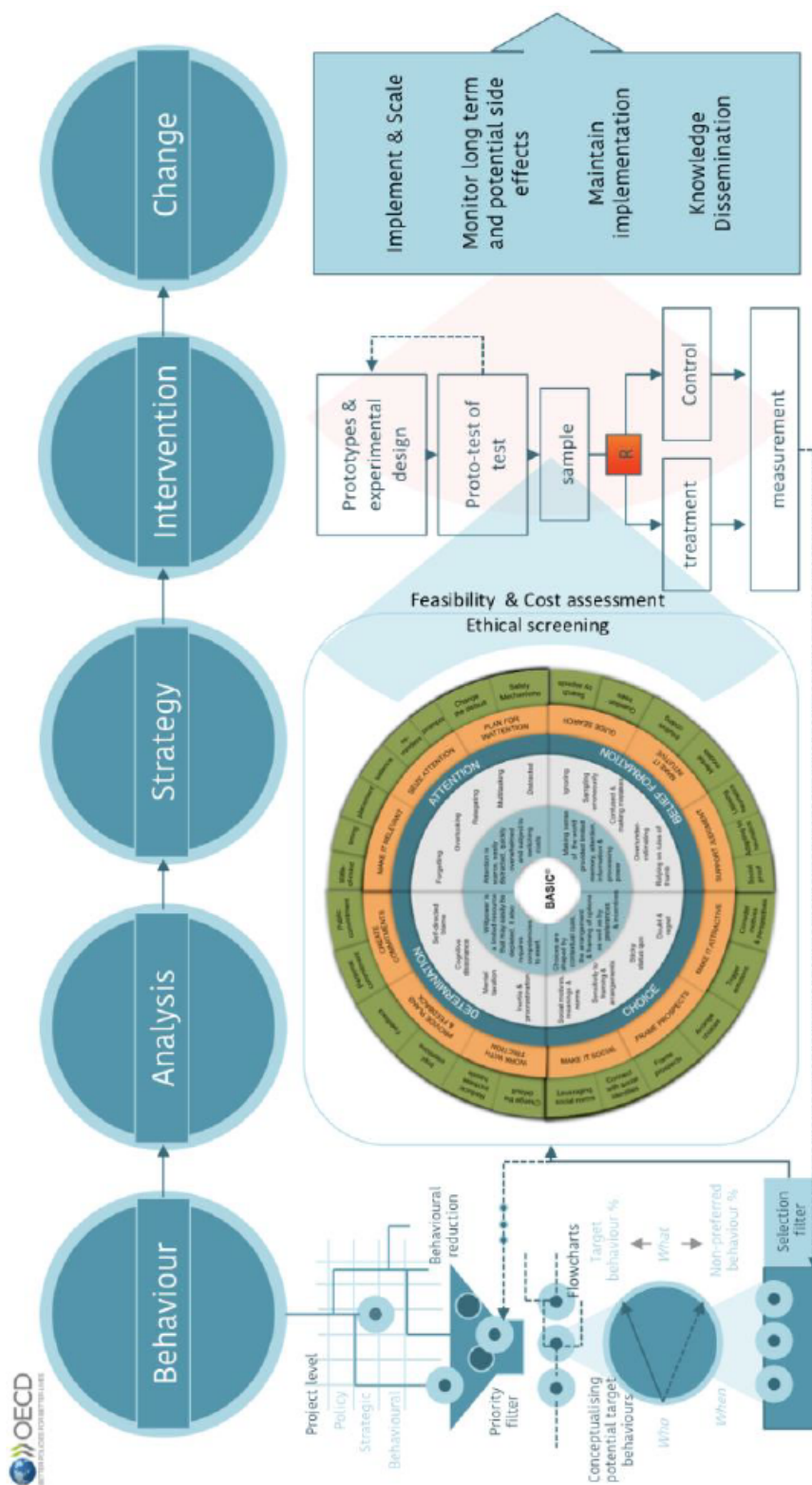


Figure 4.1: Source: Hansen (2018) for the OECD

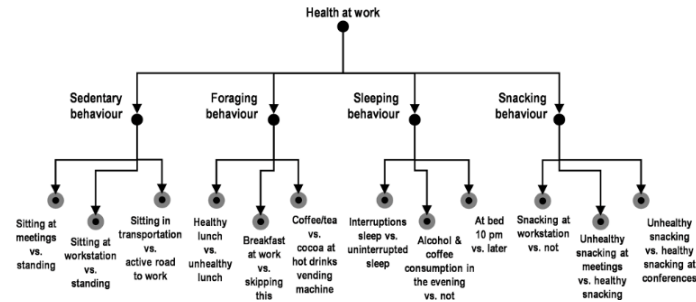


Figure 4.2: Source: Hansen (2018) for the OECD

Decomposing the policy problem through behavioural reduction

The goal is to decompose the main policy issue at a policy level in its lower level, such as strategic and behavioural ones. Hence, the first thing to do is to identify the main policy problem afflicting the selected market at a high level. Then, decompose the problem at a lower level (i.e., strategic and behavioural) in more extensive problems which are more specific and circumscribed. This tool helps practitioners to connect the high-level problem to a specific problem by using a hierarchical branch tree. A sample of the tool is presented in Figure 4.2. While developing this chart, it is essential to understand whether the defined problem depends on behaviour (behavioural) or market structure (structural). This is a critical point because only the first type is eligible for developing a behavioural insight project.

Describing potential behaviours using behavioural maps

The goal is to conceptualize more in details the prioritized behavioural problems. Practitioners should create flowcharts of the overall decisional process in order to identify the exact moment where the decision is taken so that behavioural insights can be applied there to change the given behaviour as policymaker desire (consider that if the behaviour is part of a decisional chain, the overall chain should be described). It is recommended to make a macro flowchart of the overall decisional process and then micro flow charts of the single behavioural problems. When making the flowchart practitioners should define the following main elements:

- identify a generic agent (who?);
- provide agent with the set of available options (what?);
- provide the context on which the set of available options take place (where? When?);
- Write down a distribution frequency of each available options highlighting how often the desired choice over the unwanted one occurs.

Such conceptualization helps to understand better the behavioural problem to be analysed. See Figure 4.3 to see the elements of a classical flow chart.

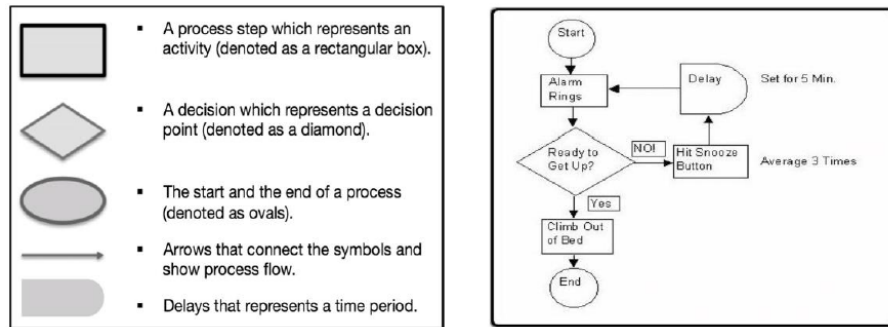


Figure 4.3: Source: Hansen (2018) for the OECD

Prioritizing behaviours to be included in behavioural insights project

The goal is to assign a priority rank to behavioural level policy problems, in order to assess and identify the problem with the highest potential. It is a multi-criteria problem; thus, it is necessary to define criteria to be applied with the selected decision method. Therefore, practitioners should define criteria they prefer according to the specificity of context they are working in. As a sample of possible criteria, efforts put in the past by policymakers might tell about the difficulty of changing the given behaviour, or the impact in terms of costs, time, resources, risks, variability, whether the change of behaviour occurs, frequency of behaviour occurrence, and so on. Nevertheless, OECD has provided practitioners with a priority filter questionnaire in order to give a simple but effective frame that can be generally applied in all context. The questionnaire is shown in Figure 4.4; it uses a Likert scale defined as following: (1) = definitely not; (2) = probably not; (3) = uncertain; (4) = probably; (5) = definitely. Such a questionnaire is helpful because it takes into account the context of the project, including the perspective of the overall stakeholders' group.

Practitioners might want to be sure that selected problems are behavioural and not structural. This can be done by using a brief flowchart presented in Figure 4.5. For each problem, the tool confirms whether the problem is eligible to apply behavioural insights and it eliminates inappropriate alternatives.

Identify behaviours with the best potential for a behavioural approach

Now it is time to identify and choose the behaviour that is more suitable for behavioural insights experiment. This is the convergent part of the *Behaviour* step. The output of this step is the definition of the target problem to be analysed more in-depth in the following steps of *BASIC* tool. Given the prioritized list of behavioural problems, practitioners can use a variety of heuristics to determine the target problem, for instance:

- Maximum sum of scores from the questionnaire (see Figure 4.4);
- A multi-criteria method.

Practitioners should feel free to use the decisional method that better satisfy their needs. The outcome of the *Behaviour* step is the target problem to be analysed in the subsequent steps.

Problem behaviour identified:							
Question			Score				
1.	1.	Does the behaviour appear to be a <i>behavioural problem</i> ? That is, does the behaviour occur despite people having good reasons to act otherwise as judged by themselves?	1	2	3	4	5
2.		Are the reasons for a change in behaviour well documented? That is, is the evidence that supports question (1) produced by methodologies compatible with the psychological theories underpinning BI?	1	2	3	4	5
3.		Has similar problems been addressed with Behavioural Insights? That is, can you identify studies or projects where BI have been applied to a similar problem?	1	2	3	4	5
4.		Is a change in the behaviour an institutional priority? That is, would a group of policymakers in the domain intuitively evaluate changing the behaviour as an institutional priority?	1	2	3	4	5
5.		Could changing the behaviour serve as a 'proof of concept'? That is, would a success in changing the behaviour serve as a proof-of-concept in addressing a wider set of policy issues?	1	2	3	4	5
6.		Is targeting the particular behaviour uncontroversial? That is, will policy-makers, citizens and relevant societal organisations agree that it is legitimate to try to change the behaviour with BI?	1	2	3	4	5
7.		Are relevant stakeholders motivated and ready to engage? That is, would relevant stakeholders have the time and willingness to engage in a project concerning the behaviour if you asked for their collaboration?	1	2	3	4	5
8.		Are the relevant arenas accessible for the BI project? That is, are the arenas in which the problem unfolds accessible to the behavioural insights team relative to ownership and/or privacy issues?	1	2	3	4	5
9.		Is the relevant data accessible? Will it be relatively easy to get hold of existing data or record behavioural data in light of practical and/or ethical issues?	1	2	3	4	5
FINAL SCORE:							

Figure 4.4: Source: Hansen (2018) for the OECD

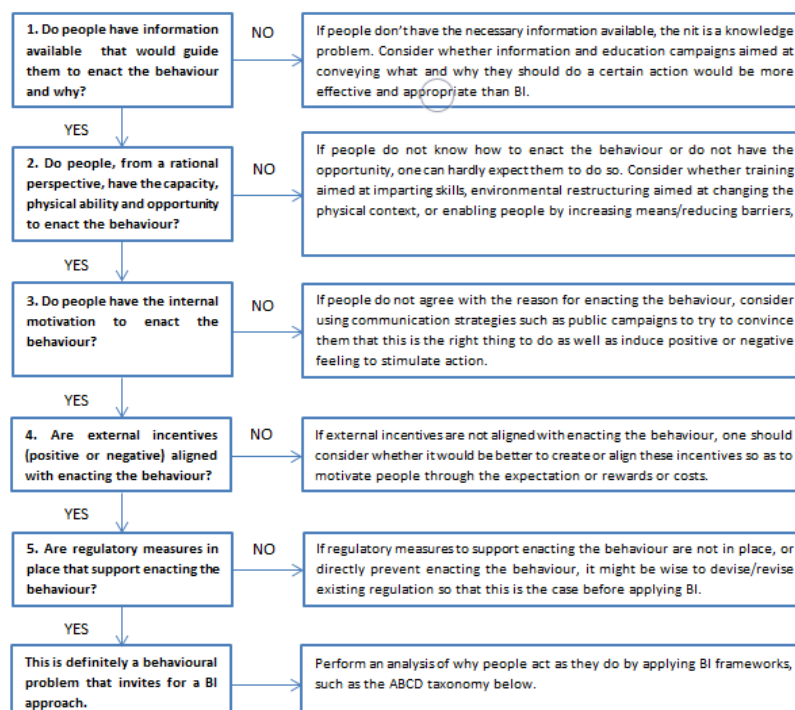


Figure 4.5: Source: Hansen (2018) for the OECD

4.1.2 Analysis

Once selected the target problem, the goal is to analyse it in depth in order to assess it, hence generating the best strategy to make the behaviour change as policymaker wishes. *BASIC* suggests using *ABCD* methodology, a simple framework useful to understand why people act as they do and not otherwise. A critical piece of advice for practitioners: do not ask people why they act in a specific behaviour at the same time assuming their actions are out of ratio boundaries, because it would be a contradiction. Indeed, behavioural sciences widely demonstrated as memories, beliefs, preferences, intentions and experiences are not mental facts but are constructs assembled by circumstances that recall them; not by chance they say "the mind is flat". For this reason, surveys, interviews and similar should be avoided or, if used, be taken as mere exploratory experiments, aiming at looking for the truth, not at providing it. Besides, practitioners should consider that the experience and an deep knowledge of the problem matter.

Behind *BASIC* stands the idea that through a systematic and iterative inquiry combined with informative behavioural KPIs and mixed methods, as well as small scale testing, field experts get the chance to form hypotheses based on the best intuitions according to the best available evidence and then test those hypotheses.

The steps of the *ABCD* method are:

- select the target problem (done in the previous step of the *BASIC* tool);
- get more familiar with the studied problem by carefully looking for already existing data about it and examine them;
- create indicators about behavioural aspects that might be the causes of the target behavioural problem;
- consider all data that can be collected on the field about target problem, if possible;
- determine whether other potential data can be recorded through BI in order to support the process of hypothesis testing;
- came back in the study field and collect data, if possible, and conduct a hypothesis test.

The tool assumes that each behaviour can be categorized into one of the following four domains:

1. **Attention:** it is the focus people have in a given context;
2. **Belief:** it is the elaboration of judgements based on available information;
3. **Choice:** it is the choice-making among a set of available options given the set of preferences;
4. **Determination:** it is the choice-making and being stick to the same choice.

Attention

Attention represents the mind window and the critical ability defining the boundaries of conscious thought. Rationality regarding attention assumes that everybody is Spiderman or Wonder Woman. Instead, behavioural science sees attention as scarce and subject to switching costs. Therefore, these problems on attention affect what matters and bring to distortions. From a rational perspective behaviour is freely decided, instead, from a behavioural perspective it is influenced by a multitude of factors, namely:

- **Forgetting:** people need triggers to pay attention and enact a specific action; without these triggers, some people may forget to act in a way they would act instead in the presence of these triggers;
- **Overlooking:** people need some triggers to be aware of different alternatives; otherwise, they would neglect appropriate actions;
- **Relegating:** sometimes people tend to lose attention on a particular action and relegate, mainly if signals are provided in useless context;
- **Multitasking:** very often people act more than one action simultaneously, in a way that the more actions are acted at the same time, the more people lose attention for each action reducing the ability to perform them correctly;
- **Distraction:** if people change tasks performing them in quick sequence or they are distracted by irrelevant signals from context, cognitive performances suffer, as well as retention memory.

Belief

Belief formation is mainly about deciphering the environment and creating a coherent vision of the world that well fits the domain of people's mind in order to make choices limited to psychological boundaries imposed by attention, memory, information, processing power. Hence, even though the economic assumption on people rationality request people to be Einstein when dealing with belief, things are quite different:

- **Ignore relevant information:** people tend to ignore information that does not fit in their world vision, or they fear of psychological discomfort. Even though they are looking for new information, they tend to form beliefs only considering existing information they already have, if sufficient to achieve a conclusion (confirmation bias);
- **Erroneous sampling:** sometimes people are looking for information that confirms their existing vision; in uncertain contexts, people tend to make sample mistakes; it is a consequence of confirmation bias;
- **Confusion:** depending on the context people might find difficulties in discerning whether a piece of information is relevant or not; for instance, people confuse the credibility of what is said depending on the confidence and relation with the person they are talking to;

- **Under/over-evaluation:** people tend to underestimate when concepts are abstract, such as probability, money, time, risk; at the same time they tend to overestimate the importance of new information, especially if not granted, or depending on how time-consuming the task is;
- **Relaying to much on heuristics or rules of thumb:** people tend to rely on heuristics to get to conclusions, especially in uncertainty conditions; they use shortcuts to pass from a complex world to a simplified but processable one.

Choice

This psychological domain regards how preferences are made and how multiple factors influence choices. If rationality requires people to be Spiderman regarding attention, Einstein regarding belief formation, the choice role is played by Garri Kasparov, the famous Russian chess player. Nevertheless, the process of choice-making is distorted by cognitive elements:

- **Doubt, disappointment, regret:** a set of confusing and/or sophisticated options can lead people to have doubt ex-ante and disappointment and/or regret ex-post the choice;
- **Stick to status quo:** whoever takes decisions ends up wasting time and resources in a lost investment (sunk cost fallacy) or rejecting a good and reasonable offer in favour of something already owned (endowment effect) or that implied effort to create it (IKEA effect);
- **Sensitivity to framing and arrangements:** choices are influenced by weak preference, whereby they are highly sensitive to small changes. Besides, they prefer the first framed option, or the intermediate one (compromise effect) or extreme choices when options are complex (extremeness effect) or they choose options framed as weakly dominant (the asymmetric dominance effect);
- **Social motives, meanings, norms:** sometimes extrinsic motivation influences a choice that should be only based on intrinsic motivation (crowding out of motives). Hence, people may opt for a non-preferred option whether there is a social meaning (social meaning reaction), or imitate celebrities (social, imitation, status cascades) or are influenced by social norms (conformity), or they choose default option because it is perceived as the socially accepted option (following the herd).

Determination

Determination is about sticking to choices over time; but determination is challenged by problems such as will power, self-regulation, self-control. When people fail in this, especially in long-term choices, where they should be determined (if rational), it is interpreted as "akrasia" or will weakness. Therefore, people must be like Gandhi when dealing with determination; unfortunately, there was only one Gandhi. Indeed, determination is significantly affected by three dimensions: mental taxation afflicts people under pressure but also people in bad and/or poor conditions of their life, competences and architectural choices. Causes of all this are:

- **Cognitive dissonance:** when people face challenges for long-term goals, they are stressed or, at least, uncomfortable; this can generate heartbeat speeding, hate and affect body state. Cognitively people look for ways to achieve immediate gratification in long-term goals (motivated reasoning) or may exaggerate the desirability of a long-term goal (effort justification);
- **Mental taxation:** this causes less lucidity in people's mind and leads to consumption and saturation of attention, that produce potential negative consequences such as distraction, counterproductive actions, cognitive deficits;
- **Inertia and procrastination:** it means entirely (inertia) or temporally (procrastination) avoiding an action. Psychological strategies are necessary, because people in order to justify inertia and procrastination tend to avoid, negotiate, distract or blame other factors;
- **Excessive self-directed blame:** when challenges lead to defeats, people can blame themselves and feel regret.

4.1.3 Strategies

As mentioned, *ABCD* is a tool that, given the analysis made in the previous steps, suggests simple strategies fitting behavioural analysis. Such strategies can be of four types: nudge, push, curling or boost:

- **Nudge:** it aims at influencing the behaviour by intentionally applying behavioural approaches not only in behavioural analysis but also as strategical mean in order to change the behaviour. It does so through nudges on specific aspects of choice architecture inside people way of thinking, not necessarily rational, so that they make the desired choice. Practitioners should use a nudge in case people have limited cognitive abilities by using their rational agency;
- **Push:** it aims at changing the behaviour by emphasizing and reinforcing choice architecture aspects to push a rational behaviour, thus avoiding people to perform complex decisions. Instead, they are pushed to make meta-decisions by prioritizing target behaviours so that problems are solved through reflective thinking. Practitioners should use a push strategy when people have limited cognitive abilities to use the rational agency or against laziness;
- **Curling:** it aims at making it easier for people to use their agency when dealing with decisions by strengthening their competencies in taking decisions. Practitioners should use this strategy when people want to get an outcome from reflective thinking, or they lack competencies;
- **Boost:** it aims at weakening, removing or contrasting psychological mechanisms through the elimination of frictions in choice architecture. Practitioners should use a boost strategy when people have limited motivation, or they lack self-control.

Domain 1: Attention

Attention is the window of the mind. However, attention is scarce, easily distracted, quickly overwhelmed and subjected to switching costs. Hence, practitioners might find solutions to attention problems by making it more relevant, seizing attention or planning for inattention.

Make it relevant The goal is to trigger people in relevant ways in order to attract their attention at the exact time, place and correct point in which people are more inclined not to do the desired behaviour. Making an action relevant is a precondition for the desired action. This can be done in different ways:

- **State of mind:** depending on people's state of mind they are more affected by biases; thus, policy intervention should create a state of mind that makes people more inclined at acting the desired behaviour (e.g. giving people an apple before shopping changes people state of mind in a way that they are more inclined to buy healthy food [54]);
- **Timing:** given the same situation people changes attention level depending on the timing (e.g. promoting a healthy diet changes results if the promotion is made in the morning or at night before sleeping [48]);
- **Placement:** also placement changes behaviour impact; indeed, some places are public others are private, and some places are close to the promoted action others are far (e.g. condoms close to the cashier, where people see what other people do and buy, versus vending machine, whereby some people may feel embarrassed in buying condoms at the cashier while others may feel virile [13]).

Seize attention Depending on the context, some people might have problems in paying attention to what matters and what is irrelevant, especially when dealing with complex decisions and/or contexts. Here are some suggested strategies:

- **Salience:** it works with irrational aspects of people way of thinking in order to seize their attention in a specific moment of the decisional process (e.g. the most famous experiment is putting fake flies inside the WC to reduce cleaning costs [19]);
- **Reminders:** it adverts people that their attention is required in a specific moment (e.g. SMS, letters);
- **Prompts:** it is barriers that stop the process unless people make a choice, thus forcing people to pay attention for a particular choice; this can be easily done in digital environments, but it works only if prompts are relevant (e.g. when asking about donation).

Plan for inattention It aims at examining what happens when people lose attention and then at planning and designing strategies for inattention, namely:

- **Default:** because people live complicated lives, they tend not to dedicate enough time and efforts to a multitude of choice, thus relaying on defaults

options, so that it is not necessary to be concentrated. Sometimes they choose default options without even knowing they are required to take a decision (inattention based default effect). Besides, if they are aware they are making a choice, people tend to choose default option because complying to it is perceived as correct or socially accepted (e.g. in donation [32]). From the policymaker perspective, planning defaults correctly is critical.

Domain 2: Belief

Main strategies when dealing with belief issues are: guiding search, making inference intuitive and suggesting judgments.

Guiding search Neoclassical theory suggests that in order to avoid market failure related to information asymmetry or information incompleteness, it is sufficient to provide people with more information. However, it is not always a correct strategy; indeed, information overload is a factor potentially affecting belief. However, it is deemed that every person has cognitive capabilities and skills of collecting the overall available information and compare the options deciding for the one providing the maximum expected net utility. Hence, some strategies are possible to guide search:

- **Searching by aspect:** the strategy is to give a relative importance to the aspect of the choice and make a decreasing rank from more relevant to less important aspects so that people can manage information that matter at first and eventually use secondary ones; this is very useful in a digital environment;
- **Question/decision tree:** it models a sequence of decisions in order to get to the final decision, thus decomposing the problem (e.g. call centre).

Making inference intuitive On one hand policymakers may guide behaviour; on the other, it may put effort and design context to make people autonomously understand what to do. Behavioural insights use models such as Human Factors [64] and User-centric design [42] to eliminate frictions:

- **Intuitive coding:** it deals with providing information in a way that people can use *System 1* of thinking mechanism. It is used especially when construing user interfaces;
- **Mental models:** it is about creating mental representations of real, hypothetical or imaginary situations people can choose, and transfer them in real-world through their mental sphere. Therefore, in doing so, they ignore some information and fill the necessary missing ones with automatic insertion of signals.

Suggesting judgments People need to make judgments, that is passing from pre-existing beliefs to new beliefs. In this process, they rely on heuristics and shortcuts. Tversky and Kahneman [59] found out three main heuristics people use: anchoring and adjusting, availability, representativeness. Nevertheless, over time many more heuristics has been found out. *BASIC* suggests three ways to deal with supporting judgments:

- **Using heuristics:** heuristics can be used to influence specific behaviours. However, practitioners should be careful in using heuristics;
- **Adapting to heuristics:** make sure that information is provided to people in a way that they match with heuristics they use in order to make a choice;
- **Social proof:** people always look what other people do, especially if they belong to the same social group; therefore, a strategy practitioners might use is highlighting social proof of the action by acting a positive behaviour.

Domain 3: Choice

When making a decision, people may suffer biases and use heuristics. *BASIC* provides practitioners with some strategies such as making a choice more attractive, framing some aspects and exploiting social context.

Making it attractive The main rule about choice is to make it attractive, that is finding the best way to connect intrinsic motivations with emotive triggers working as external motivations. This can be done with different approaches:

- **Consider intrinsic motivation:** every choice must have an intrinsic motivation to be made; it is considered intrinsic if people do not receive any apparent reward apart from utility of the activity itself; instead, it is considered extrinsic in cases concerning money, fame, commands, punishment promises. Nevertheless, motivational crowding theory [22] suggests that in some circumstances, intrinsic motivations may be influenced by providing external motivations. Thus, it is necessary to connect the two worlds to make the strategy work;
- **Make secondary motivation salient:** often secondary motives are used by people as decisive elements for the final decision. Therefore, it is necessary to make them salient;
- **Trigger emotions:** triggering emotions is critical to influence choices; in particular, this is massively exploited in marketing, while very few in public policy communications.

Framing aspects Framing aspects finds application in behavioural insights; indeed, by merely working on the way options are presented, people behaviour might change. Therefore, the choice among alternatives differs depending on the timing when information is provided. This might cause several problems in principle-agent situations. Practitioners should use these results in their strategy intervention:

- **Arranging choices:** it assumes that people choose an intermediate alternative other than extreme ones (compromise effect). Hence, restaurants should offer three wines and not just two if they want people to pay a high price because they would choose the lowest when facing two alternatives, while the intermediate wine when facing three alternatives; needless to say that this is all irrational;

- **Framing choices:** it assumes that people's choice changes when formulation changes; for instance, when deciding if proceeding with a complicated surgery, providing the information that there is 80% of chances of surviving is better than 20% of dying. It is the same thing from a rational perspective, but it is not from a cognitive perspective.

Making it social People are a human being. As such, they need to feel the sense of belonging to a community, that influences their choices and behaviours. How to exploit this factor?

- **Connecting with social identities:** a critical mechanism moving people behaviour is the comparison, identification and recognition with the peers belonging to the same social group in terms of same or similar social status; it works as well for social groups people aim at belonging to, but do not belong yet;
- **Leverage social norms:** practitioners might exploit social norms to highlight a choice that is socially accepted by the community; this strategy works especially when free-riding is made public, whereby people belonging to the same community may see if others are free riding.

Domain 4: Determination

Dealing with frictions It is common for people to have the intention of doing something, but it is less likely for them to do it; indeed, world people live in is complicated, because everyday people deal with multiple goals to achieve, and they tend to postpone decisions when facing obstacles, even if small. Therefore, they procrastinate generating behavioural inertia; also, when deciding not to decide they stick to the status quo. Practitioners should address this problem by making it more accessible for people to choose through the elimination/reduction of frictions working as obstacles. A practical approach is curling:

- **Changing the default:** people tend not to pay attention or to get distracted by irrelevant elements of the context; hence, by putting default options they sometimes do not even realize they are making a choice; in such cases practitioners should put as default option the one policymakers believe as more suitable; yet, if people realize they are being asked to make a choice still they would choose the default option;
- **Changing the hassle factor:** it is about eliminating factors obstructing an action in favour of the desired choice or increasing frictions in not desired choice, or both if possible.

Providing plans and feedbacks Some behaviours need to be kept over time, not just the first time. Apart from attention problems, mental taxation and balance of conflicting goals might lead to failure in loyalty to behaviours and choices. It is often a problem caused by a lack of external feedbacks rather than scarcity of internal resources. Hence, boost strategies are usually used:

- **Implementation intentions:** the idea is to divide a macro-goal affecting the long-term sphere in more micro-goals in the short-term sphere; this way if-then chains might be realized, creating a virtuous path;

- **Providing feedback:** it is whatever mechanism that provides information to people about a long-term goal or the improvement in its realization.

Creating commitment Sometimes, people suffer present bias, that is preferring themselves in the present world than future where potential risks and difficulties lay; this is clearly due to people risk aversion. Practitioners should exploit this bias by planning short-term actions (in the present) in order to achieve long-term goals (in the future):

- **Personal commitments:** practitioners should connect people with their social identities, thus nudging people to get a personal commitment that remains private and not public;
- **Public commitments:** likewise, people may be connected to social identities by leveraging social norms; thus, people stick to the plan because people expect them to do so.

4.1.4 Intervention

The outcome of the *Strategies* step is a list of potential strategies to be tested whether they worked or not. Thus, practitioners should design an experiment, that is demonstrating a causal link between the intervention, working as the independent variable, and the result, working as the dependent variable. Experiments should provide evidences on the mechanism causing the effect and under what conditions (given by the context); indeed, context helps practitioners at estimating how far findings can be generalized. The best way to design an experiment is a randomized controlled trial, although it is not always applicable.

Randomized controlled trials

A randomized controlled trial is the most effective method to evaluate if the intervention worked. Indeed, it is widely used in the scientific community because it minimizes the distortion of exogenous variables to the model. Incidentally, it is named the gold standard. Since generally standards matter in communications (also among scientific literature) such method should be preferred by practitioners when applying the *BASIC* toolkit, if possible.

The method randomly allocates participants to two groups: the first, namely treatment group, receives the treatment, and the second, namely control group, does not. Then, intervention is applied to the first one, and it is observed and measured whether differences between the two groups exist on the dependent variable. To be noted that random allocation is critical to ensure that the two groups are statistically equivalent in terms of known and unknown characteristics. Therefore, if no other variable could influence the results, the difference must be attributed to the intervention. There are four ways to conduct a randomized control trial:

1. **Post-test-only RCT:** it is the classical test, and it works as explained before. See figure 4.6 for its operation;
2. **Post-test-only two treatment RCT:** it is similar to the traditional one, but there are two treatment groups rather than one, and there is

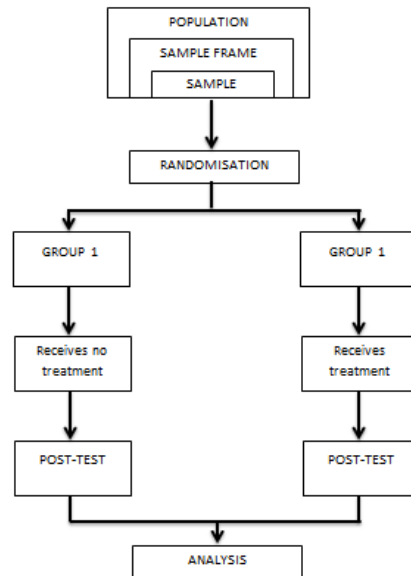


Figure 4.6: Source: Hansen (2018) for the OECD

one control group. It is recommended to have one control group because otherwise the difference observed would be between the two different interventions, but the difference with status quo cannot be measured; also, there might not be the difference between the two groups but a strong one with status quo, but experiments would not measure it;

3. **Pre-test post-test RCT:** participants receive a pre-test and are then randomly allocated to the treatment group and control group, independently on the pre-test results. Then treatment is conducted with a post-test, working like the traditional one. Results of the two groups are then compared, including both pre-test and post-test changes of participants in the two groups;
4. **Pre-test and post-test comparison RCT:** it is same as pre-test post-test RCT, but both groups receive treatments.

Factorial design

Factorial design tests two or more independent variables and their potential simultaneous effect by combining more interventions at the same time. Figure 4.7 shows an example of factorial design with two interventions. This method is more complicated because it requires a higher sample size; therefore, it is not suitable if stress in terms of resources or time exists. A multi-layered experiment might be conducted in order to partially avoid the sample size issue: it does not explore all possible combinations when adding a new intervention; on the contrary, it just adds an intervention to the previously existing ones without

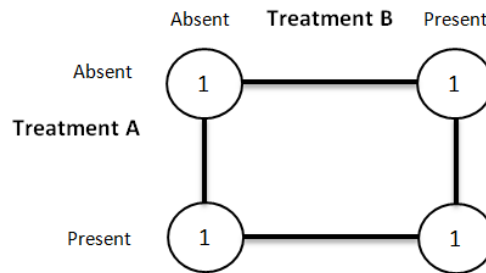


Figure 4.7: Source: Hansen (2018) for the OECD

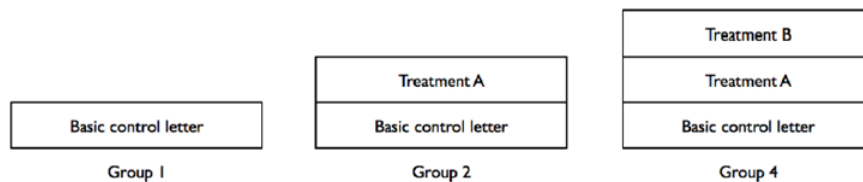


Figure 4.8: Source: Hansen (2018) for the OECD

exploring, for instance, the new intervention alone. See Figure 4.8 to understand how multi-layered method works.

Quasi-experiments

The foremost issue practitioners might face in randomized controlled trials is the random allocation of participants. Indeed, in practice, it might not be enabled by contextual constraints. It may not be allowed by people behaviour: in fact, randomly allocating people might change the target behaviour, thus introducing an external bias that cancels the casual relationship intended to measure. Therefore, quasi-experiment is considered as the second-best choice. It simply cancels the randomization problem by not randomly allocating participants. However, equivalence between groups cannot be guaranteed. Generally, to estimate sample size in advance, it is necessary to run a power analysis.

Generalizing findings

Generalizing findings means to use experiment results and expand its findings to a broader context than the experiment context. For instance, after analysing customer behaviour in a particular area, findings might be generalized by applying intervention on a broader region assuming behaviour inside the wider area does not change respect to the experiment. Generalization hides many pitfalls, practitioners should be aware of and avoid. There are two strategies for generalization:

1. **Direct demonstration:** practitioners should design other experiments in different contexts and see whether results are similar;

2. **Making a case:** by using sample representativeness, it is possible to generalize findings to different contexts.

Consider that also the *ABCD* framework is a generalised tool because it takes strategies that worked for a multitude of context, thus assuming it works in similar contexts.

Experiment steps

The overall steps for experiment design and implementation are:

1. Identify a prototype strategy that really could work if implemented at a policy level; it is the outcome of the *Strategy* step of the *BASIC* toolkit;
2. Collect feedback from stakeholders of the experiment to improve prototype intervention;
3. Determine experimental variables;
4. Select what type of experiment to run, namely if in the studio or in the field, and its design by considering real-world constraints; determine as well desired sample size and effect size;
5. Develop protocols to test the intervention, also including sampling procedures, data collection and data analysis;
6. Get approve and pre-registration of the experiment by main project stakeholders;
7. Conduct a pilot experiment or pre-test in order to understand better:
 - if technical, institutional and systemic aspects work, that is being sure nothing could go wrong;
 - unpredicted factors (e.g. time);
 - Potential effect size indicators;
 - Feasibility of data analysis;
 - Eventual intervention revisions.
8. Run the experiment;
9. Analyse results;
10. Describe the experiment in written: procedures, results and prospective.

4.1.5 Change

After testing whether the intervention worked through the experiment design in the previous step, it is time to implement behaviourally-informed interventions. Consider that at this stage lots of effort has been put in the project; thus, practitioners should not underestimate the importance of concretely implement behavioural insights at a policy level, thinking the project has come to an end and that implementation is going to be an easy task. However, some experiments, even if generating incredible findings, might not see the light of policy

implementation, thus wasting the effort of *Behaviour*, *Analysis*, *Strategies* and *Intervention* steps. Practitioners should follow a few recommendations in order to prevent such undesired scenario, such as revisiting political and project level and running some steps for the project implementation.

Revisiting the political and project level

Contexts change all the times, sometimes even rapidly and out of the blue. Although the *Behaviour* step prevents context from significant changes through filters that help to select the most suitable behaviour target, still context might change due to external factors:

- **Digitisation:** in case of project concerns digital platforms or innovative technologies, since some project might take months or even years to be completed, there might be new constraints or possibilities that need to be evaluated for policy implementation;
- **Policy interests:** policy interests (sometimes) and political interests or opportunity (very often) change over time; this means that a project considered as a priority may no longer be such;
- **Regulatory context:** a project aiming at changing a particular behavioural issue might have been overcome by new traditional regulatory actions or abrogation of a law, thus cancelling the effects of the ongoing project;
- **Institutional structure:** over the period of the behavioural project new institutional reforms might have been put in place; therefore, practitioners should take into account these changes before implementing a behaviourally-informed policy intervention;
- **Public opinion:** sometimes public opinion might be well concerned, positively or negatively, about the implementation of a new intervention at the policy level; therefore, practitioners should consult citizens, businesses, organizations and other interested stakeholders to ensure the project from failure due to hostile public opinion, thus getting support from main stakeholders.

Important steps for implementation and creating broader impact

After designing and implementing the experiment in a small scale, practitioners need to implement the intervention in a large scale, thus moving in the successive steps of the policy cycle. The outcome of this stage is to get information to feed new behavioural insights projects turning back to stage 1 of the *BASIC* toolkit, in order to achieve the intended policy goal actively. When moving in the policy cycle after a small scale project, the main items are:

1. **Implementing and scaling behaviourally-informed policies:** consider that the new findings from behavioural insights might have a broader impact, such as changing the law or the regulation scheme. When implementing and scaling behavioural insights solutions, it is necessary to rely on behavioural insights here too. Before doing so, practitioners should consider when, where, and how results might fail when generalizing results.

During the implementation new measures and KPIs should be tracked to monitor the development of the implementation itself. Finally, mitigating behavioural policies compared with small-scale experiment should be avoided, because results might not be the same in large-scale context. Indeed, people working in policy institutions might not see the potential of a BI approach when dealing with a project for a BI implementation, thus not putting necessary effort in achieving the intended goals. Therefore, practitioners should maintain BI approach throughout the overall policy cycle;

2. **Monitoring long-term and potential side effects:** small-scale experiments are usually limited in resources; thus, their potential effects are unknown or quite unclear when scaling up interventions. Therefore, it is critical to track precise KPIs throughout the overall policy cycle in order to monitor long-term effects. Moreover, also side effects measurements should be tracked, in order to provide policy institution information on behavioural insights effectiveness; indeed, this will improve the long-term effectiveness of new policy initiatives;
3. **Maintaining the policy initiative:** very often, policy intervention is valid only if maintained over time. Likewise, a short-term lack of effectiveness might push policy institution to substitute these initiatives with traditional policy actions, thus failing in achieving long-term effectiveness of BI initiatives. To avoid maintenance issue practitioners should provide stakeholders with updates in the intervention implementation with materials stakeholders desire;
4. **Disseminating knowledge:** behavioural insights approach in policy-making is relatively new; thus, scientific literature has plenty of space to welcome new BI findings; however, null-results are not published due to publication bias. Instead, null-results should be published as well to improve future BI initiatives. Therefore, it is necessary to write down as much as possible about BI experiments in order to spread knowledge in the scientific community, providing a comprehensive database of BI projects. Moreover, it is also important to get political support to institutionalize BI approaches among policy decision-makers.

4.2 Application of the "Behaviour" step

4.2.1 Behavioural reduction structure

The goal of this step is identifying the target behaviour that will be analysed in the process of developing behavioural insights. Hence, a behavioural reduction structure has been designed in Figure 4.9 to join the wide and vague policy level with the more specific behavioural level.

4.2.2 Describing potential behaviours using behavioural maps

In order to give a priority rank to behavioural level problems, a primary analysis is necessary to make a first assessment. A macro flow-chart (see Figure

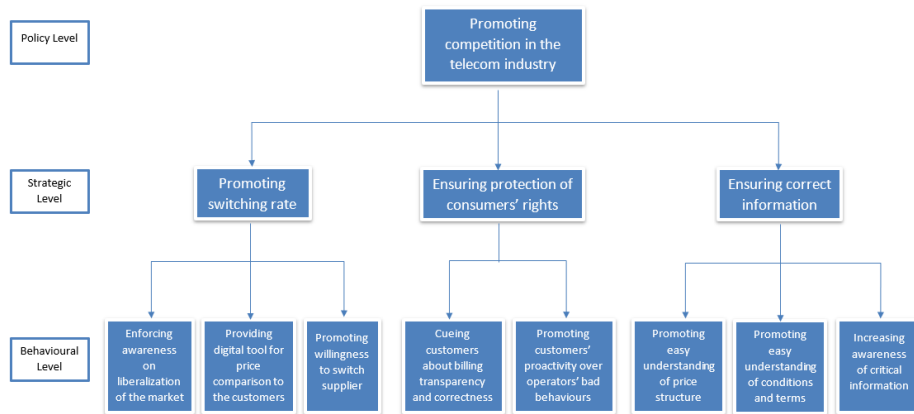


Figure 4.9: Behavioural reduction structure for promoting competition in telecoms market

4.10) shows the overall policy problem. To be noted that a few modifications on flow-chart have been made compared to the symbology used in Figure 4.3; indeed, UML activity diagram [15] has been used through ASTAH software.

The customer might want to enter a telco store for different reasons, such as having a problem in some telecom services (e.g. mobile), be willing to buy a new telecom product (e.g. mobile, data, broadband service, new telephone), watching advertising on telecom products through different communication means. While entering a Vodafone store, usually a member of store staff welcomes the customer, even though it is not his turn yet. While waiting to be served, often people look around the store to spend the waiting time. When finally his turn comes, he tells a staff member the reason why he got there, and the staff member serves his request. When finishing with the initial request (if this was not about a new broadband service), the staff member is taught to propose to switch to Vodafone broadband service; if he accepts to talk about it, staff member explains the service (what is included in the offer), the price structure, conditions and terms and other eventual necessary information. Afterwards, the customer decides whether to switch or not. If he signs the contract, physical activation is usually made within fifteen working days; the customer receives the bill every month, while the payment is automatically made through the bank account. Billing of broadband service goes on until customers decide to switch to a new broadband provider.

Although this process flows for certain customers, it hides many pitfalls for lots of others. Indeed, the customer might face several problems (behavioural, informational, structural) and get several frictions, and, in lots of cases, never getting to the end of the process. For instance, some customers might still not know that broadband market is liberalised for years. However, several new broadband providers are present in the market apart from Telecom. Or, even though being aware of liberalisation, people may procrastinate to switch provider. The former is less likely because advertisings are displayed on TV for years. The latter appears as a behavioural problem because for several reasons people postpone the decision of changing operator; such reasons are sticking to the status quo, doubt, disappointment and regret, cognitive disso-

nance and inertia and procrastination, since switching provider is a decision affecting medium/long-term utility. Policymakers might find new solutions to increasing people willingness and/or propensity to switch provider.

Other people, given high overload information about services, prices, terms, conditions might not manage to understand which provider better suits his needs. Hence, providing customers with new digital tools for active price/service comparison might be the right problem solution.

While talking with the store staff member, many problems might arise: for instance, customers might have problems in getting complete and precise understanding of relevant information, due to attention saturation, information overload and confusion. Policymakers might look for solutions aiming at increasing understanding and awareness on price structure, relevant information, conditions and terms.

However, after buying new broadband services, behavioural problems may still arise. Indeed, because billing is automatically paid through bank accounts, customers might not look at its correctness, thus giving incentives to the operator to make him pay small additional amounts, since the customer does not notice. Besides, people might face difficulties in enforcing their rights against technical disservices of the connection and billing mistakes. Therefore, policymakers might strengthen people proactivity towards their rights enforcement and trigger awareness on billing correctness.

4.2.3 Prioritizing behaviours to be included in behavioural insights project

It is time to prioritize the behaviours shown in Figure 4.9; firstly, the questionnaire shown in Figure 4.4 has been filled. It was deemed to choose this questionnaire because of its completeness and adaptability to the telecom market related to behavioural insights aiming to achieve. The questionnaire has been completed trying to maintain impartiality, after analysing all the problems at a behavioural level. Results are shown in 4.11. A Likert scale has been used to answer the questions.

Before deciding a decision method, a filter for each behavioural level problem is applied in order to check if the problem is behavioural or structural, thus to be addressed with a BI approach or traditional policy initiatives. Indeed, a filter check shown in Figure 4.5 is applied. The tool suggests that the following problems are behavioural:

- Promoting willingness to switch broadband provider solves a behavioural problem;
- Cueing customer about bill transparency and correctness solve a behavioural problem;
- Promoting an easy understanding of price structure solves a behavioural problem;
- Increasing awareness of relevant information solves a behavioural problem.

Instead, other problems are caused by non-behavioural reasons:

- Enforcing awareness on the liberalization of the market solves a knowledge problem;

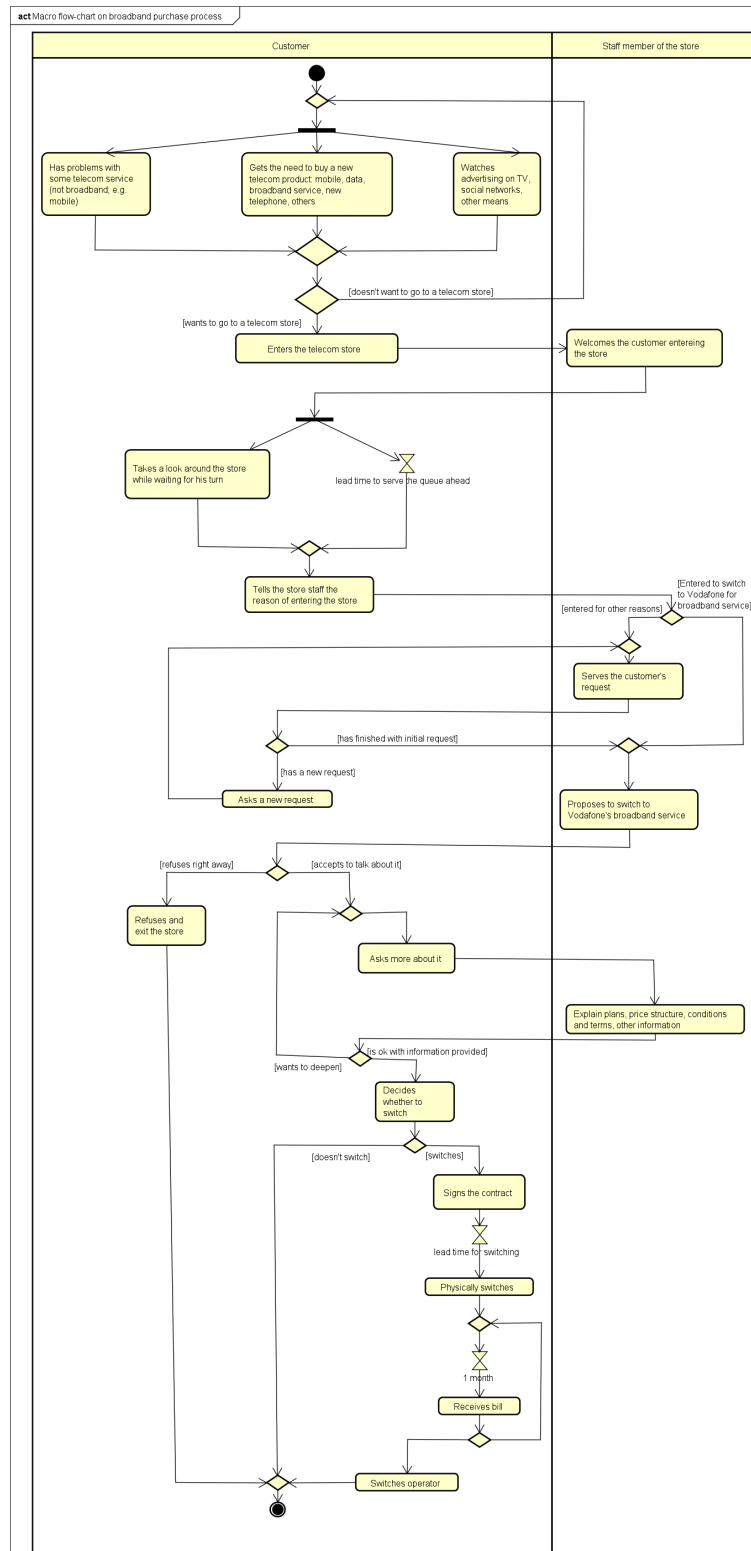


Figure 4.10: Macro flow-chart of broadband purchase process

Question	Behavioural level problem							
	Enforcing awareness on liberalization of telecom market	Providing customer digital tool for active price comparison	Promoting willingness to change	Cueing customers about bill transparency and correctness	Promoting proactivity against operators bad behaviour	Promoting easy understanding of price structure	Promoting easy understanding of conditions and terms	Increasing awareness of critical information
1. Does the behaviour appear to be a behavioural problem?	1	2	5	4	3	2	2	2
2. Are the reasons for a change in behavioural well documented?	1	4	5	5	3	4	4	4
3. Has similar problems been addressed with Behavioural Insights?	1	5	2	4	4	2	2	2
4. Is a change in the behaviour an institutional priority?	2	2	5	5	5	5	5	5
5. Could changing the behaviour serve as a 'proof of concept'?	1	4	4	5	5	4	4	4
6. Is targeting the particular behavior uncontroversial?	5	5	3	5	5	5	5	5
7. Are relevant stakeholders motivated and ready to engage?	1	1	5	2	2	3	2	2
8. Are the relevant arenas accessible for the BI projects?	1	1	5	1	1	4	4	4
9. Is the relevant data accessible?	1	4	5	3	2	4	4	4

Figure 4.11: Behavioural reduction structure for promoting competition in telecoms market

Alternatives	$J+(a,a')$	$J=(a,a')$	$J-(a,a')$	$\frac{W(+) + W(-)}{W(\text{tot})}$	$\frac{W(+)}{W(-)} \geq 1$	aSa' (k=0,66)
(a1, a2)	{1,7,8,9}	{2,4}	{3,5,6}	0,66	yes	yes
(a1, a3)	{1,2,7,8,9}	{3,4,5}	{6}	0,88	yes	yes
(a1, a4)	{1,2,7,8,9}	{3,4,5}	{6}	0,88	yes	yes
(a2, a1)	{3,5,6}	{2,4}	{1,7,8,9}	0,55	no	no
(a2, a3)	{1,2,3,5}	{4,6}	{7,8,9}	0,66	yes	yes
(a2, a4)	{1,2,3,5}	{4,6}	{7,8,9}	0,66	yes	yes
(a3, a1)	{6}	{3,4,5}	{1,2,7,8,9}	0,44	no	no
(a3, a2)	{7,8,9}	{4,6}	{1,2,3,5}	0,55	no	no
(a3, a4)	{7}	{1,2,3,4,5,6,8,9}	{-}	1	yes	yes
(a4, a1)	{6}	{3,4,5}	{1,2,7,8,9}	0,44	no	no
(a4, a2)	{7,8,9}	{4,6}	{1,2,3,5}	0,55	no	no
(a4, a3)	{-}	{1,2,3,4,5,6,8,9}	{7}	0,88	no	yes

Figure 4.12: Electre multi-criteria method

- Providing digital tool for price comparison solves a knowledge problem;
- Promoting an easy understanding of conditions and terms solves a knowledge problem that can be solved with easier information framing;
- Promoting proactivity against operators lousy behaviour is a problem that can be solved with more robust regulatory measures.

4.2.4 Identify behaviours with the best potential for a behavioural approach

The problems that passed the check filter of the precedent paragraph are:

- Promoting willingness to switch broadband provider (a_1);
- Cueing customer about bill transparency and correctness (a_2);
- Promoting easy understanding of price structure (a_3);
- Increasing awareness of critical information (a_4).

These represent the alternatives from which to choose the target problem. Selection criteria are the questions in the questionnaire shown in Figure 4.11. Although *BASIC* toolkit suggests taking the sum of scores of the questionnaire because of its computational simplicity, it creates issues in terms of scale measures. Indeed, the Likert scale used to answer the questionnaire is an ordinal scale and the addition is not an allowed operation. Therefore, being a fully structured problem, Electre II method has been used, since it allows to rank alternatives in order without violating scale measures rules [20]. Results are shown in Figure 4.12 and Figure 4.13. All the criteria have the same weight.

Alternatives ranking is the following: $a_1 > a_2 > a_3 \approx a_4$.

4.3 Application of the "Analysis" step

Before analysis behaviour target, it is suitable to deepen the product object of analysis: broadband service. This is a type of product where brands try to compete on differentiation (with difficulties) but tend to align their prices for

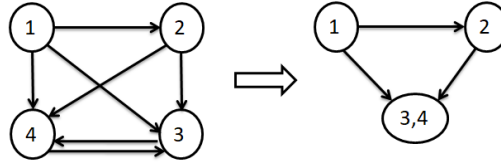


Figure 4.13: Electre: outclassing graph

two main reasons: collusion and the fact that there is vertical differentiation; thus customer is price sensitive. Indeed, customers see broadband service as a commodity. Kano's model helps to understand such considerations (see Figure 4.14). Each product or service has five possible features:

- Must be: if fully implemented, they generate neither dissatisfaction nor satisfaction, because they are necessary but not sufficient; their absence lead customers not to buy the product. They are implied, self-evident, not expressed and obvious;
- One-dimensional: if not implemented, they generate dissatisfaction, but satisfaction is linear dependent on their implementation; it is the features that might convince the customer whether to buy or not the product. They are articulated, specified, measurable, technical; these features generate vertical differentiation;
- Attractive (or delighters): they generate satisfaction if implemented but do not generate dissatisfaction if not implemented. They are not expressed, customer-tailored and cause delight; these features generate horizontal differentiation;
- Indifferent: whether implemented or not they do not generate satisfaction;
- Reverse: when implemented, they generate dissatisfaction and frustration.

In broadband market security and suitable time within to physically change operator are "must-have" features, price and speed are "one-dimensional" features, brand image and additional services (e.g. Now TV included) are "attractive" (or "nice to have") features.

There is a different approach of the customer in the purchase moment, depending on the type of brand importance and customer involvement in the point of sales:

	Significant involvement of the consumer	Low involvement of the consumer
Great difference among brands	Complex purchase	Variety seeking
Small difference among brands	No regret purchase	Frequent purchases

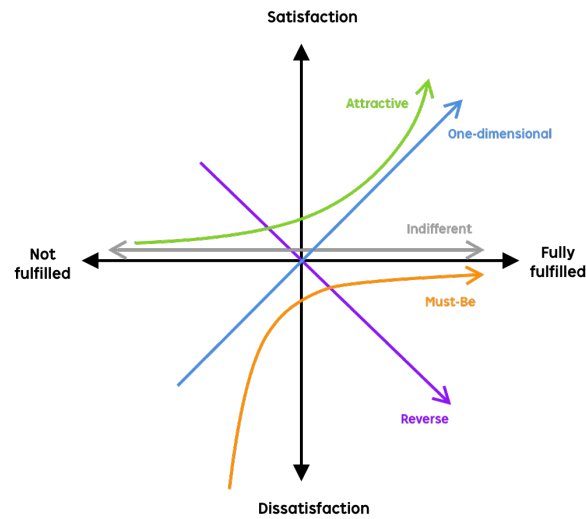


Figure 4.14: Kano's model

In the purchase of the broadband service, the customer spends much time and put much effort in the decision because it affects long-term pay-offs; moreover, there are small differences among brands, because broadband is mainly seen as a commodity. Therefore, people always look for safety purchase and is willing to pay a premium price for not having regret. Here it comes incumbent bias in broadband service: people prefer to pay a higher price to Tim because it is perceived as safe.

The analysis continues by applying bounded rationality taking into account the main process people live when switching broadband provider (See Figure 4.3). By looking at the customer journey and conducting the analysis at the store level, the customer gets inside the store for multiple reasons (need to change mobile or broadband provider, need to by a new device such as a smart-phone, need to solve a specific problem, other reasons). Here, many problems may arise, working against customer willingness to evaluate to switch broadband operator when asked to by store agent:

1. **Lead time to serve customer:** people entering a store would like to see his or her initial request be solved as soon as possible; besides, people have limited time they want to dedicate to the solution of the initial request. Therefore, waiting time works in favour of time saturation;
2. **Serving initial request:** again, as well as for waiting time, the time necessary to serve the initial request does not help, because the more it lasts, the fewer time people would dedicate to listen to agent's proposal to switch broadband provider;
3. **Deepening broadband service proposal:** at this point usually customers start asking lots of questions, because of intrinsic doubt regarding

a long-term choice; therefore, information imperfection jointed with cognitive limitation may cause both time and rationality saturation.

Hence, three main factors lead to bounded rationality in the broadband market:

- cognitive limitations regarding risk aversion and status quo bias;
- information imperfection regarding lack of knowledge of the broadband market;
- time constraints people have when evaluation this kind of products.

These considerations should be added to the intrinsic problems affecting switching broadband provider, explained in previous sections, such as fear of change, complexity of choice, information overload, decision affecting long-term pay-offs, fear of regret, *incumbent bias* (or *Telecom bias*). Therefore, people still choose the incumbent in the broadband market because of such issues.

4.4 Application of the "Strategies" step

The above analysis provides this outcome: the main problems related to low switching rate of broadband lines depend on attention and determination problems. Indeed, telecom services are perceived as commodities, plus it requires much attention from consumer to evaluate optimal choice since the market is characterized by a considerable amount of offers, mixed tariffs, packages; therefore, there is much information provided to the consumer, who have problems in elaborating them in order to make a convinced choice. Because switching broadband service is not people's primary goal during the day, people tend at sticking to the status quo. Changing a broadband provider is a long-term choice. People are intrinsically risk-averse, especially when dealing with choices affecting medium or long-term horizon, as switching broadband provider is. Even though people would decide to switch provider, they may face determination issues.

Here is a list of potential strategies developed in order to answer behavioural problems identified in the analysis stage of the *BASIC* toolkit.

4.4.1 Potential strategies

Making it attractive

- Considering intrinsic motivation:
 - A message providing how much people lose money when remaining with old broadband provider;
- Make secondary motivation salient:
 - Providing information about Vodafone Wi-Fi speed (the highest in the market among competitors);
 - Providing information about the instantaneous and automatic installation of the broadband modem, thus reducing fear of not knowing what to do;

- Providing information on data sim included when activating broadband service with Vodafone;
- Trigger emotions:
 - Putting Vodafone Power Station on the sales point; because people may feel broadband service an immaterial thing, this way people has the opportunity to see something concrete when talking with sales staff about broadband service;
 - Creating a simple game about switching broadband provider to Vodafone;

Framing aspects

- Framing choices
 - If providing information about how much people could save by switching to Vodafone broadband service, talk about how much people are losing money instead;

Making it social

- Belonging status:
 - Providing information about how many people are switching to Vodafone broadband service every given frame-time (e.g. "Every minute "x" persons switch to Vodafone's broadband service, with the number updating automatically);
 - Providing information about the degree of satisfaction of people who switched to Vodafone in the previous year.

4.4.2 Identified strategies

Among all the potential strategies listed in the previous paragraph, two main strategies have been chosen:

1. A counter displayed in a big screen inside the store counting people who are switching to Vodafone broadband provider;
2. An easy and fast game customers are asked to play with the chance of winning a reward;

Game: "Help TOBy at swithing to Vodafone broadband service"

In order to reduce frictions in the choice of switching broadband operator, gamification theory is applied. Gamification is the use of game elements and game design techniques in non-game contexts. Gamification is a powerful tool available for marketing activities in order to make people change behaviour or to engage users in activity based on a game. The main goal of gamification is trying to satisfy unsatisfied needs. Therefore, it is essential to evaluate whether to use gamification when designing a service, because it creates a better experience or it nudges people acting the desired action. Gamification has to solve a problem

and should provide rewards to the user in order to engage him in playing the game and trigger gamification mechanisms.

Hence, a brief game has been developed as follows: the user is asked to help *TOBy*, Vodafone's avatar, to switch to Vodafone broadband service. Three main activities are requested to be put in temporal order, namely:

1. Requesting a Vodafone store to switch broadband service provider;
2. Receiving the Vodafone Station from the courier;
3. Connecting the Vodafone Station.

Such activities are randomly listed. Then, a Vodafone box appears. Users are supposed to open the box and receive a reward by opening it. After opening it, reward appears, consisting in a coupon up to 10€ if the customer decides to switch to Vodafone broadband service plus Vodafone TV service. The latter is a hardware device that transforms an old TV into a smart TV by directly connecting it with the old TV. Besides, it provides all the mainstreaming on-demand media services, such as Netflix, Now TV, Sky, Amazon Prime Video, RaiPlay, MediasetPlay, Infinity, Chili. Additionally, the service includes main packages of Now TV, Infinity and Chili.

The main goal of the game is to trigger in customers' mind the idea of changing broadband service, by choosing Vodafone one, leveraging the following considerations:

- People waiting for their turn in the queue feel frustration and anger because they have the sensation of wasting time; besides, the time they planned to dedicate at staying in the Vodafone store gets saturated as time passes by. Instead, by playing the game people spend waiting time in a simple activity which ends with a reward, thus giving the sensation of spending the time for something interesting; plus gratification helps in the intent;
- The game has been developed in order to be linked to people fear of switching broadband provider; indeed, by helping *TOBy* users may see how easy it is to switch operator. Moreover, assuming that the staff manages to convince people in switching to Vodafone, many doubts may arise in people mind, thus increasing questions they ask the staff and saturating the maximum time and attention customers are willing to use. Instead, after playing the game, some doubts are eliminated in advance because users see the main steps happening when deciding to switch to Vodafone broadband service, thus reducing potential frictions in the moment of negotiation;
- Finally, the reward is a discount coupon, but it is linked to a second motivation that is put in salience; broadband service might be seen as a commodity while streaming broadcasters might trigger more reliable motivations in order to consider to switch to Vodafone broadband service.

The game has been developed in the *Adobe Xd* environment. It has been used such tool because it better suites the creation of a prototype for an initial version of the game; indeed, this project aims at getting initial market insights that, if achieving satisfactory results, will continue in the development of a more structured game. Figures 4.15, 4.16, 4.17 show main steps of the game.



Game: Step1



Game: Step2



Game: Step3

Figure 4.15: Steps 1, 2, 3



Game: Step4



Game: Step5



Game: Step6

Figure 4.16: Steps 4, 5, 6



Game: Step7



Game: Step8



Game: Step9

Figure 4.17: Steps 7, 8, 9

Vodafone counter

A second intervention has been developed in order to trigger people willing to change broadband service provider. It has been created a counter that automatically and instantaneously updates Vodafone broadband customers within the European market on an annual base. This counter is put at the point of sales so that when store the staff member proposes the customer to switch to Vodafone broadband service customers might see that at that precise moment other people are doing what the store staff member has just proposed. In order to understand what kind of counter is, Figure 4.18 shows the tool. Again, *Adobe Xd* has been used to develop such a counter. The main goal of the counter is to trigger in customers mind the idea of changing broadband service by leveraging the following considerations:

- People often rely on what other people do; therefore, watching in the screen that other people decide to switch broadband service provider might make people feel safe because they would not be the only one doing it;
- Watching that other people at that precise moment are doing what the store member is proposing to them, might trigger people to switch; besides, it might give a higher sense of immediacy because it is happening at that moment.



Figure 4.18: Vodafone Counter

Conclusion

Despite years from liberalisations, the telecommunication industry is still too concentrated, especially in the broadband market (HHI is equal to 2,981 in 2019), where the incumbent of the Italian market (i.e. Tim-Telecom) gets around half of the market share. This may be due to consumer risk aversion higher than a physiologic level. This is a typical problem of a market with the incumbent being the ex-monopolist so that after liberalisation, consumers still feel safer with the incumbent firm. From a policy point of view, it is a burden because high concentration means low competition and high prices consumers pay, hence low overall welfare.

Telecoms products are uniquely complex. Indeed, people should compare network, software, hardware, multi-part tariffs at the same time. Additionally, technological innovation makes it difficult for consumers to continually learn new products/services and comparing them with their current ones. Such complexity may lead consumers to uncertainty, whereby a change in an uncertain context might affect the stability of the status quo. People are intrinsically risk-averse, and because of lack of competences, several cognitive biases and limited time to process overall information people might never get the idea of switching telecom supplier or abandon the plan if evaluating. Regarding broadband services, an Eurobarometer conducted by the European Commission in 2014 highlights that, depending on the country, from 40% to 70% of consumers never switched broadband provider. The incumbent of the market exploits such inefficiency.

Thanks to a collaboration with Vodafone in Sardinia, Vodafone store's sales have been analysed from a behavioural economics perspective. In the analysis, it has been noted that consumers, whose current broadband provider is different from Tim, are more willing to switch supplier, while it's rarer in Tim's customers (18.4% vs 6.9%). The finding is that such difference is due to the *incumbent bias*. Hence, it is confirmed the existence of a moderate switching behaviour among operators different from Telecom, while there is a shallow switching behaviour among Tim's consumers because of status quo caused by the presence of the leading incumbent, being it the ex-monopolist of the market. Tim takes advantage of such inefficiency. Indeed, in February 2020 it offered new broadband subscriptions at a monthly price of 29.9€, relatively higher than its competitors (from +7% to +20%). Nevertheless, Tim exploits its position, especially for old customers, who pay an average monthly fee of 44.9€, a price that is off the market. Hence, it seems that the market is split into two segments: on one hand, some consumers actively search for new broadband tariffs benefiting from the competition; on the other hand, many consumers mainly stick with incumbent brand missing the opportunity of service with better quality at a lower price.

Therefore, the effectiveness of higher competition in a mature market, like the broadband market, is mitigated. Indeed, active customers may benefit from lower prices, while inactive customers don't. Indeed, Tim has the weakest service performances of the market, not because of poor investments but because the average Tim's customer has an old contract with a low-quality level of the service.

Furthermore, bundling nudges consumers to switch provider, because it gives salience to second reasons for such switch. Indeed, around 15% of switching consumers opted for the bundle option with the Vodafone TV.

However, consumers might decide to stick to Tim, not because of *incumbent bias* but because in areas where they live only Tim competes; in such case, opting for Tim is not a biased choice but a forced choice, because there aren't alternatives. In the future, it could be interesting to analyse whether incumbent bias or low supply level better explain low switching rate or both variables jointly.

Finally, *OECD's BASIC* tool for a behavioural intervention has been applied; however, given the collaboration with Vodafone, it has been used not the regulator's perspective but the perspective of Tim's rival, namely Vodafone. Hence, two interventions have been designed to make people switch to Vodafone's broadband service: a counter of people who are switching to Vodafone, and a game people are supposed to play to win a discount coupon for Vodafone's ultra-broadband service sold in a bundle with Vodafone TV.

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