



MEET MINITAB

Minitab in Ariston Thermo:
A practical example for Customer Loyalty Analysis

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Milano, May 24th

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Six Sigma Black Belt and Lean Expert certified

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Automotive background (Brembo, Rieter Automotive System,
Honeywell Inc.) joined Ariston Thermo Group in April 2013

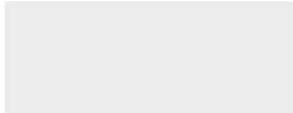




THE GLOBAL PARTNER IN EFFICIENCY COMFORT

Over 85 years of experience in providing
innovative thermic comfort solutions and services.



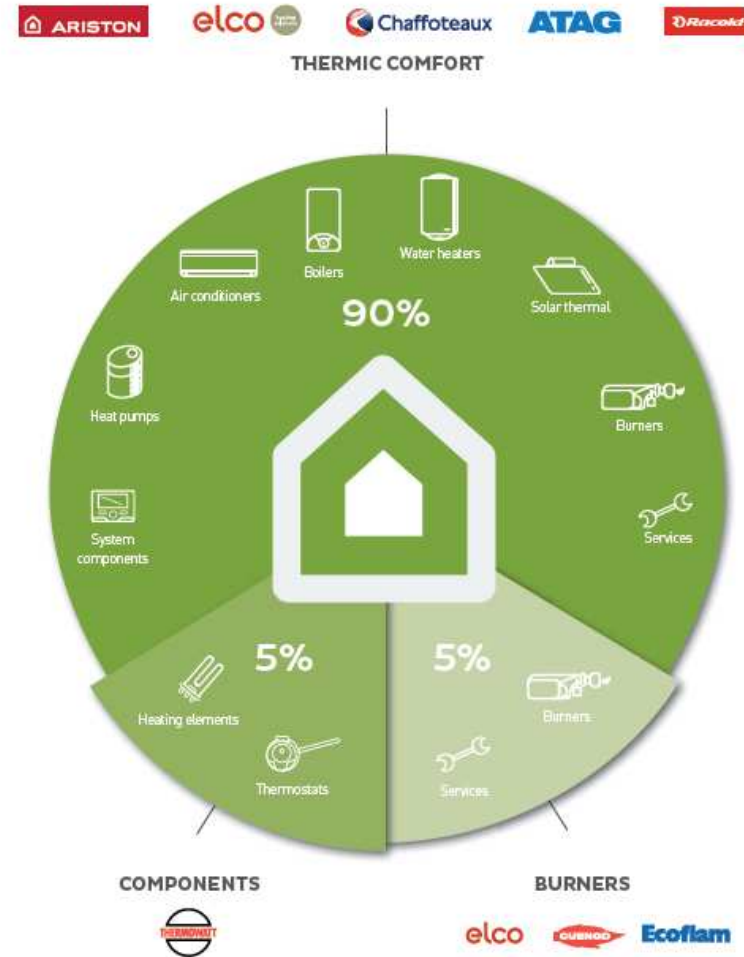


ARISTON THERMO

All over the world, Ariston Thermo is synonymous with **comfort, energy efficiency and respect for the environment**, thanks to its high efficiency products, its plants in compliance with the most advanced production standards and excellent pre- and after-sales customer support services.

The Group now has a **leadership position** in the global thermic comfort market for domestic, commercial and industrial spaces.

Ariston Thermo operates in three different sectors with leading brands and an extensive range of products and services.





THE GROUP BY THE NUMBERS

2015 highlights



1.43

**BILLION EURO
IN SALES**

89% of sales is generated outside Italy.



7

**MILLION PRODUCTS
PER YEAR**

(and over 35 million components)
Sold in over 150 countries in the world.



6,700

EMPLOYEES

Local resources hold 89%
of managerial positions.



72

**MILLION EURO IN
INVESTMENTS AND R&D**

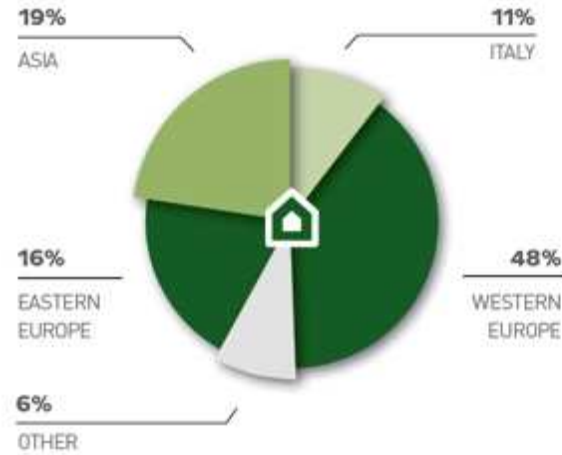
The Group features 18 centres of competence for product
research and development in 10 countries.



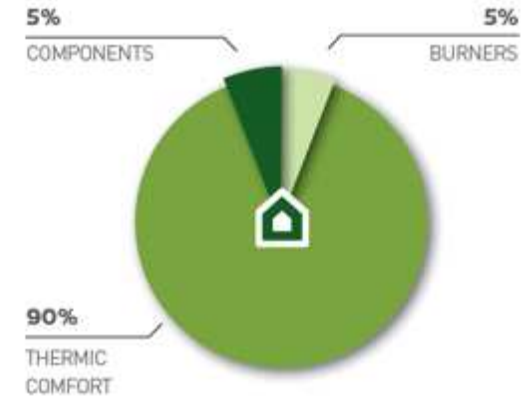
THE GROUP BY THE NUMBERS

2015 highlights

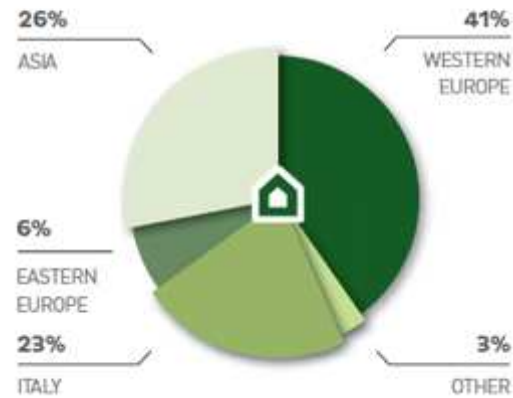
**SALES
BY GEOGRAPHIC AREA**



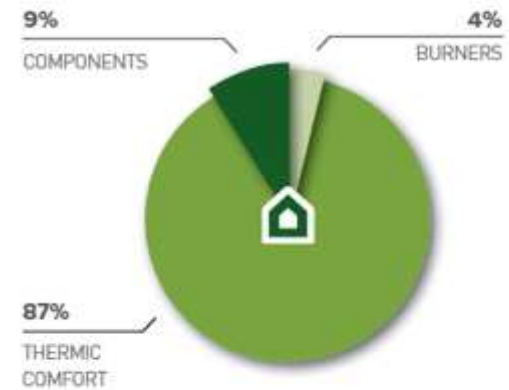
**SALES
BY BUSINESS SEGMENT**



**EMPLOYEES
BY GEOGRAPHIC AREA**



**EMPLOYEES
BY BUSINESS SEGMENT**

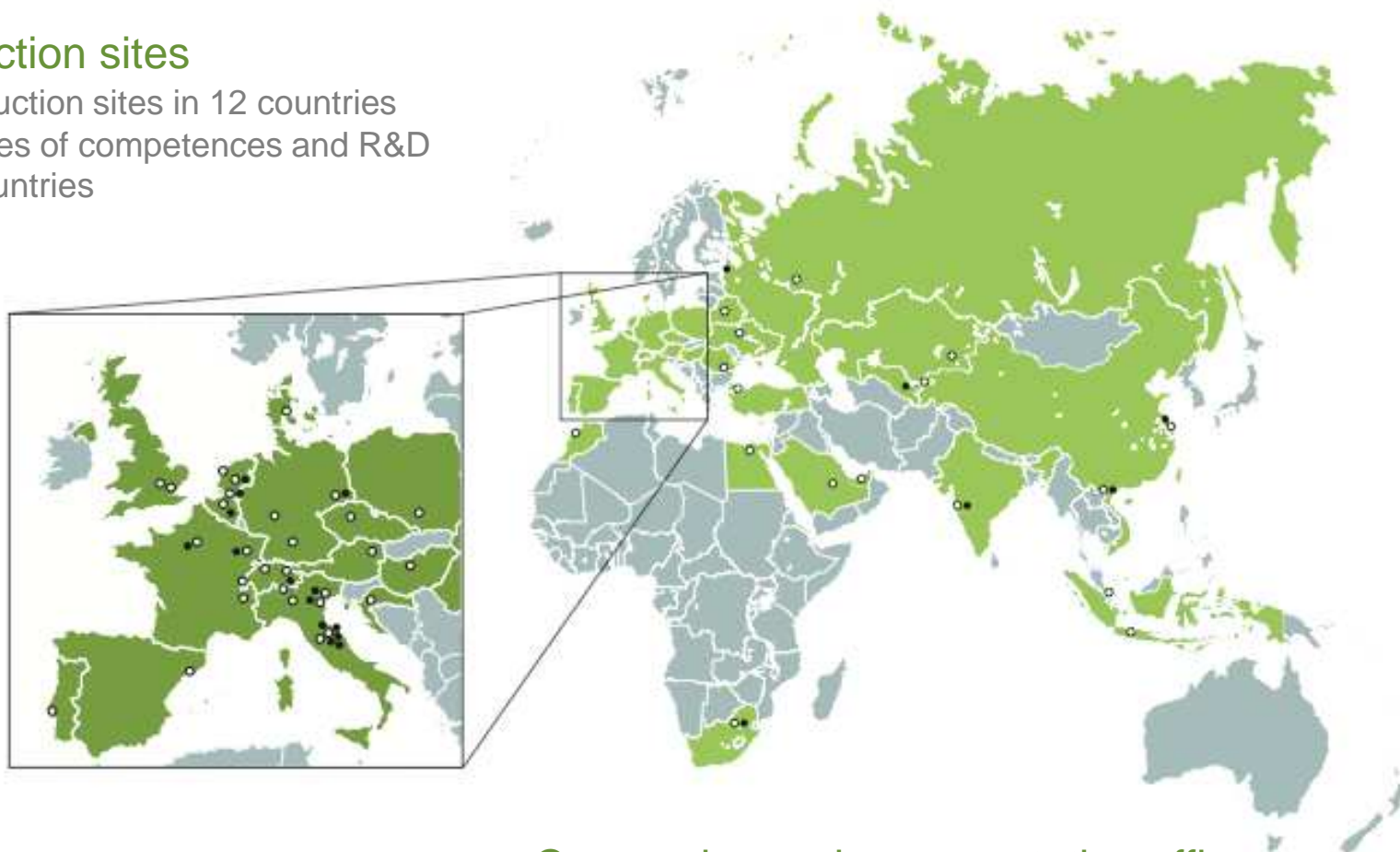




GLOBAL VISION, LOCAL ACTION

Production sites

20 production sites in 12 countries
18 centres of competences and R&D
in 10 countries

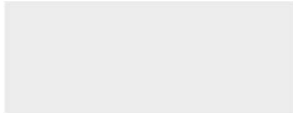


○ Direct commercial presence

● Industrial presence

Companies and representative offices

54 companies and 6 representative offices in 34 countries
150 distribution countries



EXCELLENT PERFORMANCE ACROSS ALL OPERATIONS

We work constantly to improve the Quality of products and services for our customers.



How to define Quality roadmap?

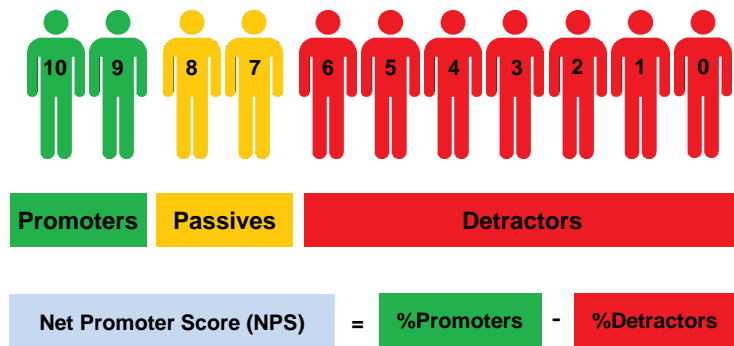
OUR QUALITY VISION



How to measure our Quality Vision?

THE NET PROMOTER SCORE

- ➔ Net Promoter Score (NPS) is a management tool that can be used to gauge the loyalty of a firm's customer relationship
- ➔ Developed by (and a registered trademark of) **Fred Reichheld, Bain & Company** and **Satmetrix**. It was introduced by Reichheld in his 2003 HBR article "*One Number You Need to Grow*"



Two key relevant questions:

Recommendation

Q1. Considering what you know about the following products, would you recommend them to your friends/relatives? (10-0)

Motivation

Q2. Why did you give the product this rating?

THE NET PROMOTER SCORE

Through other questions asked during the interview, NPS Survey offers the opportunity to investigate what are the reasons of customer satisfaction (or dissatisfaction).

*“In determining the judgment that you just gave me about **Ariston Customer Service**, could you please tell me which of the following factors I’m going to read you have influenced your evaluation?”*

- 1 Reachability of the Customer Service
- 2 Operator at the phone
- 3 On site visit
- 4 Payment and Cost&Benefit

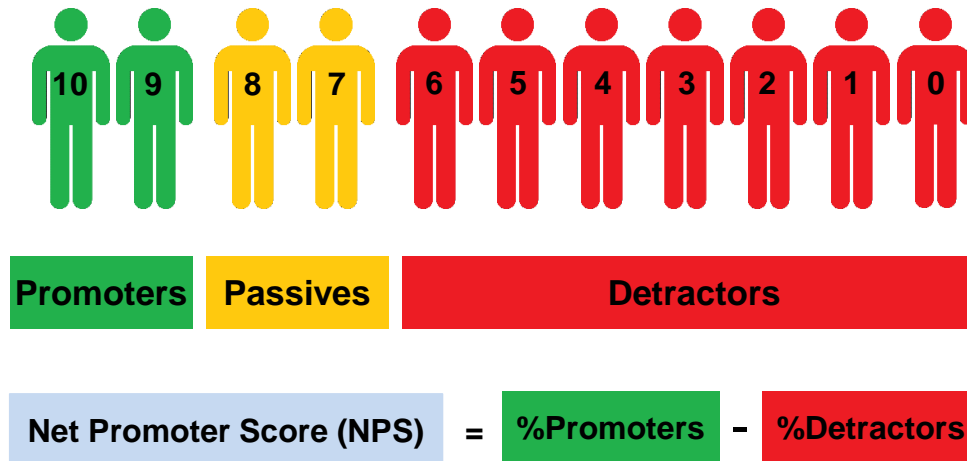
How reliable are NPS results?

MEASUREMENT ISSUE

1. What is the right sample size?
2. How to analyze the results between 2 NPS surveys?
3. How to analyze the difference between Promoters and Detractors?



HOW TO MEASURE THE NPS?



The distribution of individuals scores X

Category	X	Frequency
Detractors	-1	p_{-1}
Passives	0	p_0
Promoters	+1	p_{+1}

HOW TO MEASURE THE NPS?

Category	X	Frequency
Detractors	-1	p_{-1}
Passives	0	p_0
Promoters	+1	p_{+1}

$$E(X) = \sum_{i=1}^n x_i p_i = p_{+1} - p_{-1} = \text{NPS Index}$$

$$\text{Var}(X) = E(X^2) - E^2(X) = p_{-1} + p_{+1} - (\text{NPS Index})^2$$

The NPS Index is the mean of the distribution of individual scores x

$$-1 \leq E(X) = \text{NPS Index} \leq 1$$

HOW TO MEASURE THE NPS?

EXAMPLES								
#	1	2	3	4	5	6	7	8
p_1 (Promoters)	0	0,1	0,5	0,3	0,2	0,8	0,1	1
p_0 (Passives)	0	0,3	0	0,5	0	0	0,8	0
p_{-1} (Detractors)	1	0,6	0,5	0,2	0,8	0,2	0,1	0
Mean (X) = Index NPS	-1	-0,5	0	0,1	-0,6	0,6	0	1
Var (X)	0	0,45	1	0,49	0,64	0,64	0,2	0

The NPS Index is the mean of the distribution of individual scores x

$$-1 \leq E(X) = \text{NPS Index} \leq 1$$

HOW TO MEASURE THE NPS?

Therefore we can apply the Central Limit Theorem to identify the mean and variance of the distribution of the sample mean:

- $E(\widehat{NPS})$ = Real Value of NPS

- **Standard Deviation (\widehat{NPS}) = Standard Error (S.E.)** $= \sqrt{\frac{VAR(X)}{n}} = \sqrt{\frac{p_{+1} + p_{-1} - (NPS \text{ Index})^2}{n}}$.

Standard Error (S.E.) describes the uncertainty on the estimation of the sample mean.

The **Confidence Interval** of the (\widehat{NPS}) is given by:

$$\widehat{NPS} \pm z_{\alpha/2} * S.E.$$

Margin of Error is the maximum difference between \widehat{NPS} and NPS
and

it measures the accuracy of the results of a survey

HOW TO MEASURE THE NPS?

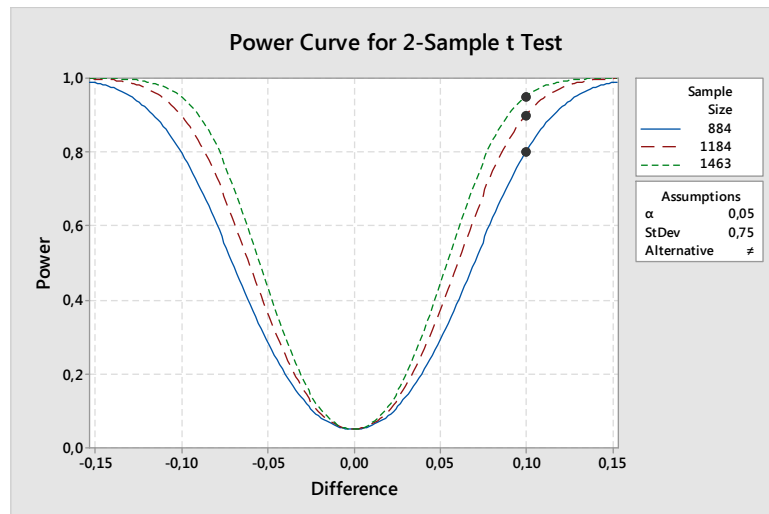
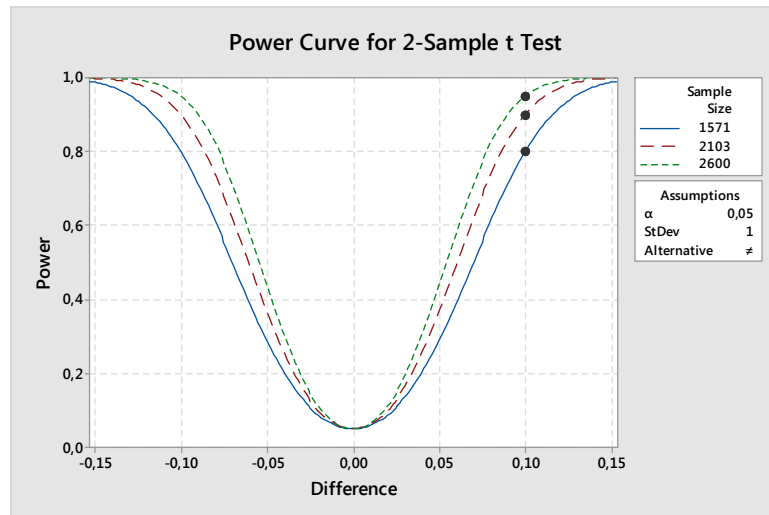
- ✓ Central Limit Theorem says that $\widehat{\text{NPS}}$ is Normal distributed
- ✓ Data observations are independent



t - test



Q1: WHAT IS THE RIGHT SAMPLE SIZE?



Power and Sample Size

2-Sample t Test

Testing mean 1 = mean 2 (versus ≠)

Calculating power for mean 1 = mean 2 + difference

$\alpha = 0,05$ Assumed standard deviation = 1

Difference	Sample Target Size	Power	Actual Power
0,1	1571	0,80	0,800067
0,1	2103	0,90	0,900075
0,1	2600	0,95	0,950007

St.Dev 1,00 → 0,75

The sample size is reduced by 44%, being necessary to interview 884 customers

Power and Sample Size

2-Sample t Test

Testing mean 1 = mean 2 (versus ≠)

Calculating power for mean 1 = mean 2 + difference

$\alpha = 0,05$ Assumed standard deviation = 0,75

Difference	Sample Target Size	Power	Actual Power
0,1	884	0,80	0,800019
0,1	1184	0,90	0,900229
0,1	1463	0,95	0,950017

Q2: DIFFERENCE BETWEEN 2 NPS (EXAMPLE)

Two-Sample t for the Mean

Summarized data

	Sample 1	Sample 2
Sample size:	1500	1500
Sample mean:	0,48	0,52
Standard deviation:	0,7	0,66

Select Options... Graphs... Help OK Cancel



Two-Sample T-Test and CI

Sample	N	Mean	StDev	SE Mean
1	1500	0,480	0,700	0,018
2	1500	0,520	0,660	0,017

Difference = $\mu(1) - \mu(2)$

Estimate for difference: -0,0400

95% CI for difference: (-0,0887; 0,0087)

T-Test of difference = 0 (vs \neq): T-Value = -1,61 P-Value = 0,107
DF = 2987

There is no statistically significant difference between two indices NPS

Two-Sample t for the Mean

Summarized data

	Sample 1	Sample 2
Sample size:	1500	1500
Sample mean:	0,48	0,6
Standard deviation:	0,7	0,66

Select Options... Graphs... Help OK Cancel



Two-Sample T-Test and CI

Sample	N	Mean	StDev	SE Mean
1	1500	0,480	0,700	0,018
2	1500	0,600	0,660	0,017

Difference = $\mu(1) - \mu(2)$

Estimate for difference: -0,1200

95% CI for difference: (-0,1687; -0,0713)

T-Test of difference = 0 (vs \neq): T-Value = -4,83 P-Value = 0,000
DF = 2987

There is statistically significant difference between two indices NPS

Q3: DIFFERENCE BETWEEN PROMOTERS AND DETRACTORS

SURVEY 1 Y = n			
Scores	p_i	Freq.	n = 1500
-1	0,12	180	Dectractors
0	0,28	420	Passives
1	0,6	900	Promoters



NPS	0,48
Var (X)	0,49
Standard Dev.	0,70
M.E.	3,5%

SURVEY 2 Y = n+1			
Scores	p_i	Freq.	n = 1500
-1	0,1	150	Dectractors
0	0,2	300	Passives
1	0,7	1050	Promoters



NPS	0,60
Var (X)	0,44
Standard Dev.	0,66
M.E.	3,4%

Repeating Survey NPS in two different years, Y and Y + 1, we get two NPS scores: 48 for year Y and 60 for the year Y + 1 → **This shows an increase in customer loyalty!**

***To understand the NPS variation we can consider trend of each proportion:
Promoters and Detractors***

Q3: DIFFERENCE BETWEEN PROMOTERS AND DETRACTORS

Two-Sample Proportion

Summarized data

	Sample 1	Sample 2
Number of events:	900	1050
Number of trials:	1500	1500

Buttons: Select, Options..., Help, OK, Cancel

Test and CI for Two Proportions : Promoters

Sample	X	N	Sample p
1	900	1500	0,600000
2	1050	1500	0,700000

Difference = $p(1) - p(2)$

Estimate for difference: -0,1

95% CI for difference: (-0,133948; -0,0660524)

Test for difference = 0 (vs \neq 0): $Z = -5,77$ (P-Value = 0,000)

Fisher's exact test: P-Value = 0,000

There is a statistically significant difference between two proportions

Two-Sample Proportion

Summarized data

	Sample 1	Sample 2
Number of events:	180	150
Number of trials:	1500	1500

Buttons: Select, Options..., Help, OK, Cancel

Test and CI for Two Proportions : Detractors

Sample	X	N	Sample p
1	180	1500	0,120000
2	150	1500	0,100000

Difference = $p(1) - p(2)$

Estimate for difference: 0,02

95% CI for difference: (-0,00238138; 0,0423814)

Test for difference = 0 (vs \neq 0): $Z = 1,75$ (P-Value = 0,080)

Fisher's exact test: P-Value = 0,090

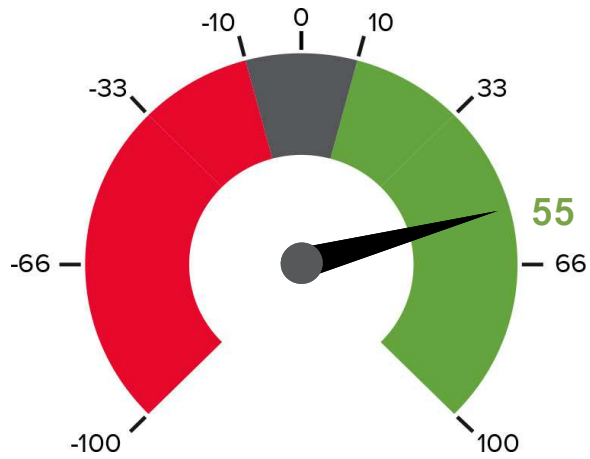
There is no statistically significant difference between two proportions

The NPS index increased because Promoters increased while Detractors were unchanged



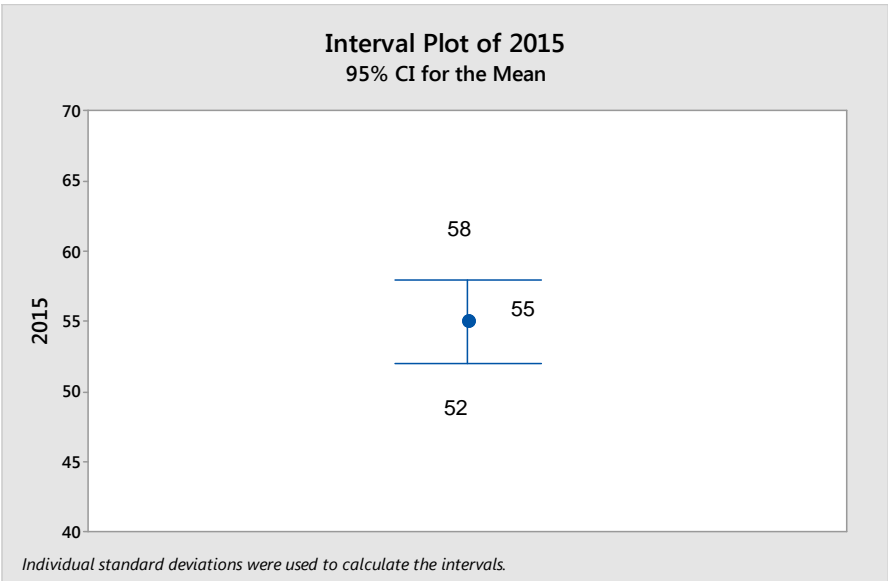
NPS APPLICATION

2015 NPS SERVICE



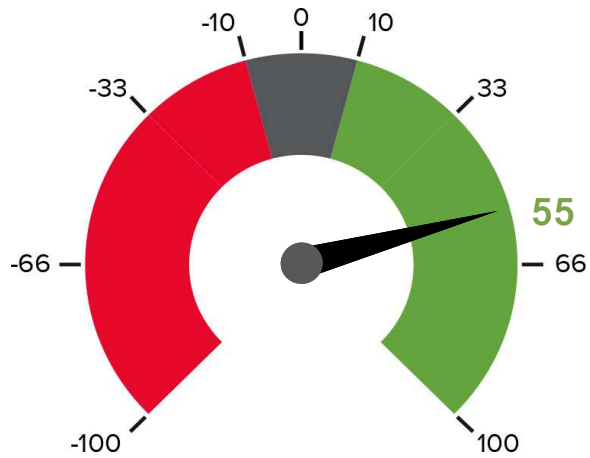
Respondents: 1,625
 Promoters: 61%
 Detractors: 6%
 NPS: 55

Size	NPS Index	Var (X)	Dev. St (X)
1625	0,55	0,37	0,61



52 ≤ NPS ≤ 58

NEXT YEAR NPS SERVICE



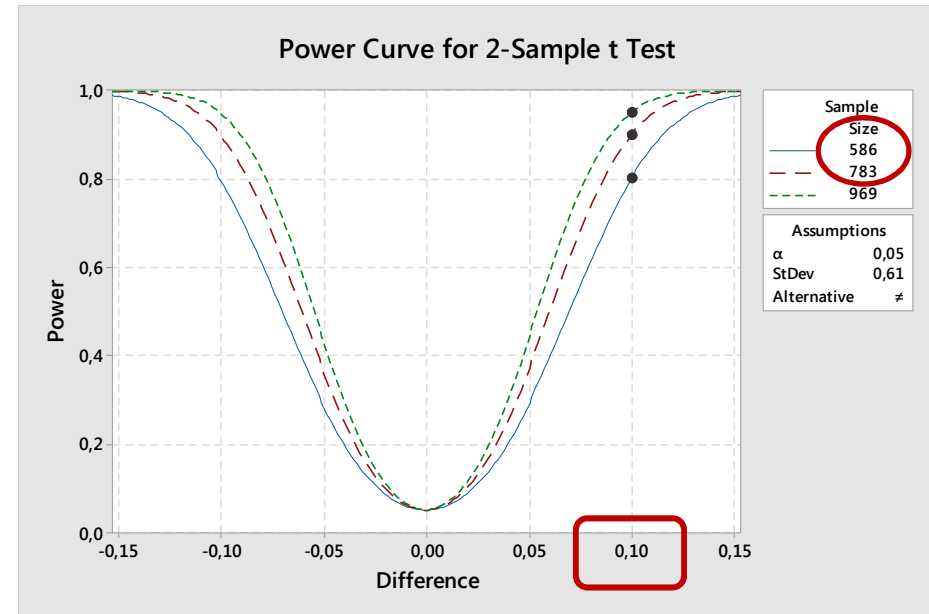
Respondents: 1,625

Promoters: 61%

Detractors: 6%

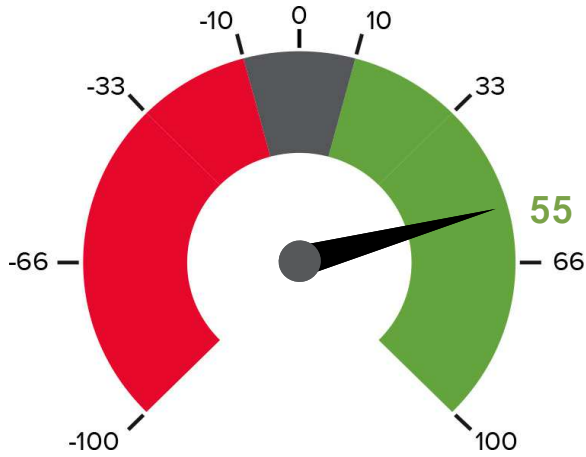
NPS: 55

Size	NPS Index	Var (X)	Dev. St (X)
1625	0,55	0,37	0,61



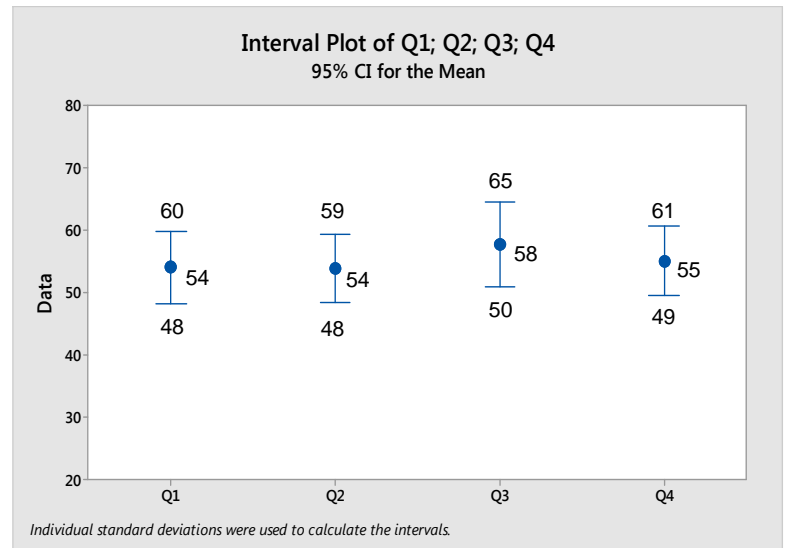
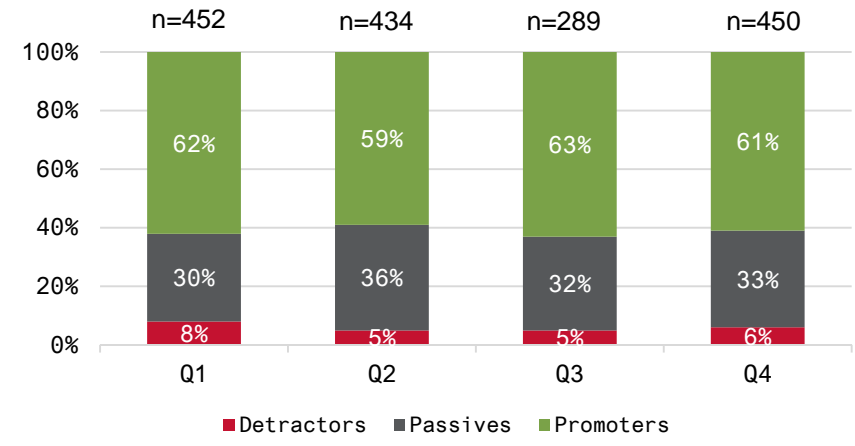
***If we accept a lower power (i.e: 0,8)
we could reduce the sample size to 586 !***

2015 NPS SERVICE



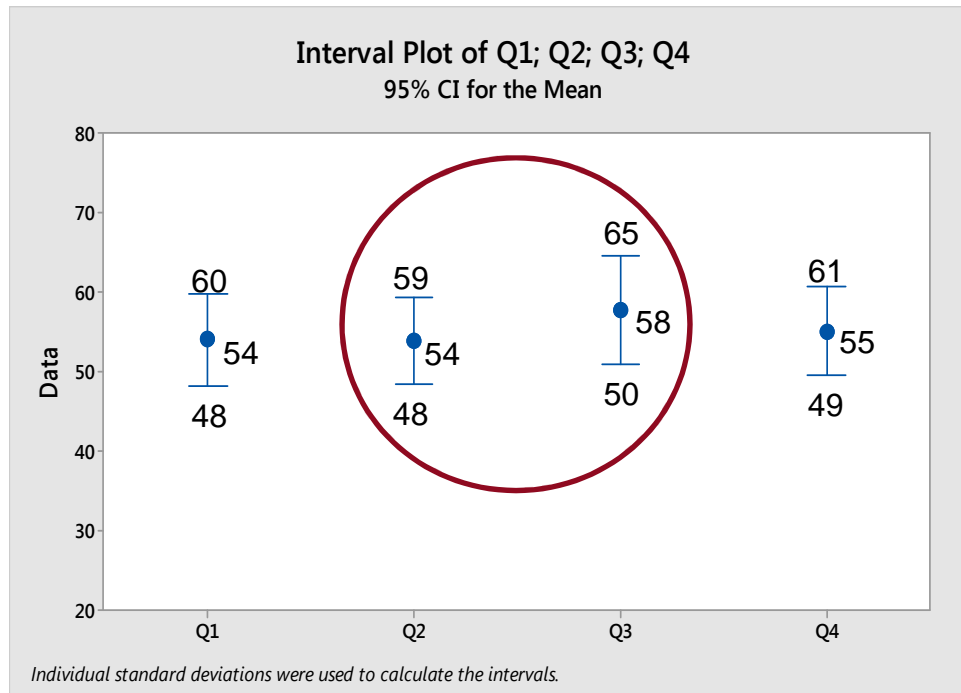
Respondents:	1,625
Promoters:	61%
Detractors:	6%
NPS:	55

Size	NPS Index	Var (X)	Dev. St (X)
1625	0,55	0,37	0,61



The graph of the confidence intervals does not show significant differences between 4 quarters

DIFFERENCE BETWEEN 2 NPS



Two-Sample t for the Mean

Summarized data

	Sample 1	Sample 2
Sample size:	439	289
Sample mean:	0,54	0,58
Standard deviation:	0,58	0,59

Select Options... Graphs... Help OK Cancel

Two-Sample T-Test and CI

Sample	N	Mean	StDev	SE Mean
1	439	0,540	0,580	0,028
2	289	0,580	0,590	0,035

Difference = $\mu(1) - \mu(2)$

Estimate for difference: -0,0400

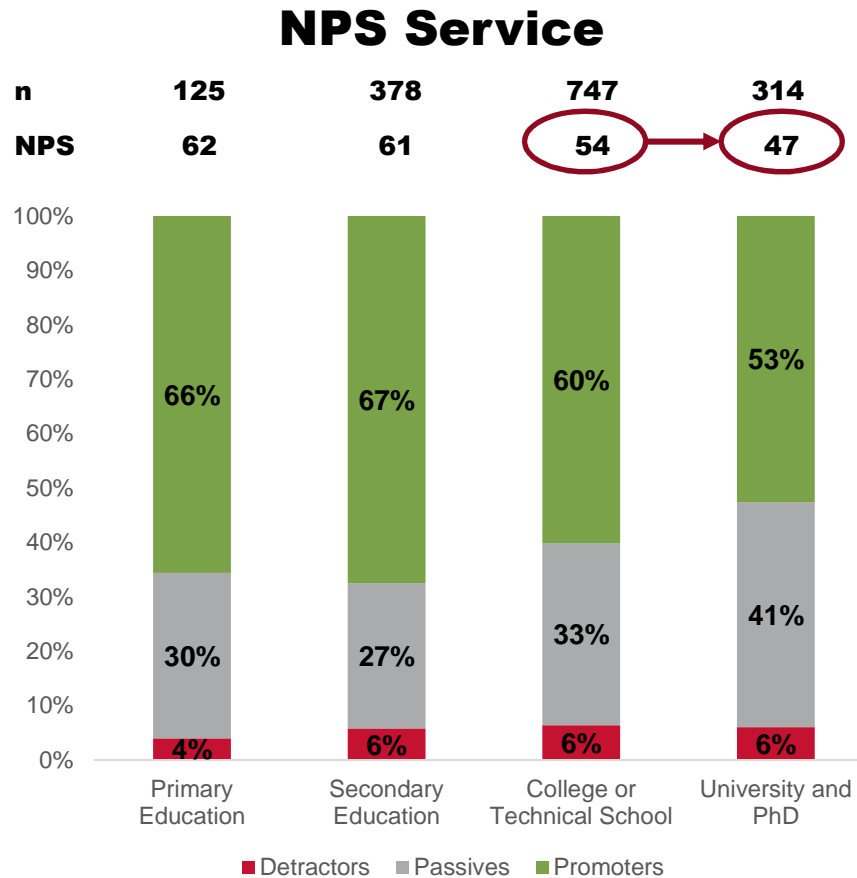
95% CI for difference: (-0,1272; 0,0472)

T-Test of difference = 0 (vs \neq): T-Value = -0,90 P-Value = 0,368

DF = 608

There is no statistically significant difference between two indices NPS

EXAMPLE: LEVEL OF EDUCATION



Two-Sample T-Test and CI

Sample	N	Mean	StDev	SE Mean
1	314	0,470	0,370	0,021
2	747	0,540	0,380	0,014

Difference = $\mu (1) - \mu (2)$
 Estimate for difference: -0,0700
 95% CI for difference: (-0,1193; -0,0207)
 T-Test of difference = 0 (vs \neq): T-Value = -2,79
 P-Value = 0,005 DF = 602

There is statistically significant difference between two indices NPS

Increasing the level of education, Passives increase and Promoters decrease → NPS decreases

EXAMPLE: ANALYSIS OF PROMOTERS AND DETRACTORS

Two-Sample Proportion

Summarized data

	Sample 1	Sample 2
Number of events:	449	165
Number of trials:	747	314

Select Options... Help OK Cancel

Test and CI for Two Proportions

Sample	X	N	Sample p
1	449	747	0,601071
2	165	314	0,525478

Difference = $p(1) - p(2)$
 Estimate for difference: 0,0755932
 95% CI for difference: (0,0101437; 0,141043)
 Test for difference = 0 (vs \neq 0): Z = 2,26 P-Value = 0,024

Fisher's exact test: P-Value = 0,025

There is a statistically significant difference between two proportions

The NPS index decreased because Promoters really decrease while Detractors were unchanged

Two-Sample Proportion

Summarized data

	Sample 1	Sample 2
Number of events:	48	19
Number of trials:	747	314

Select Options... Help OK Cancel

Test and CI for Two Proportions

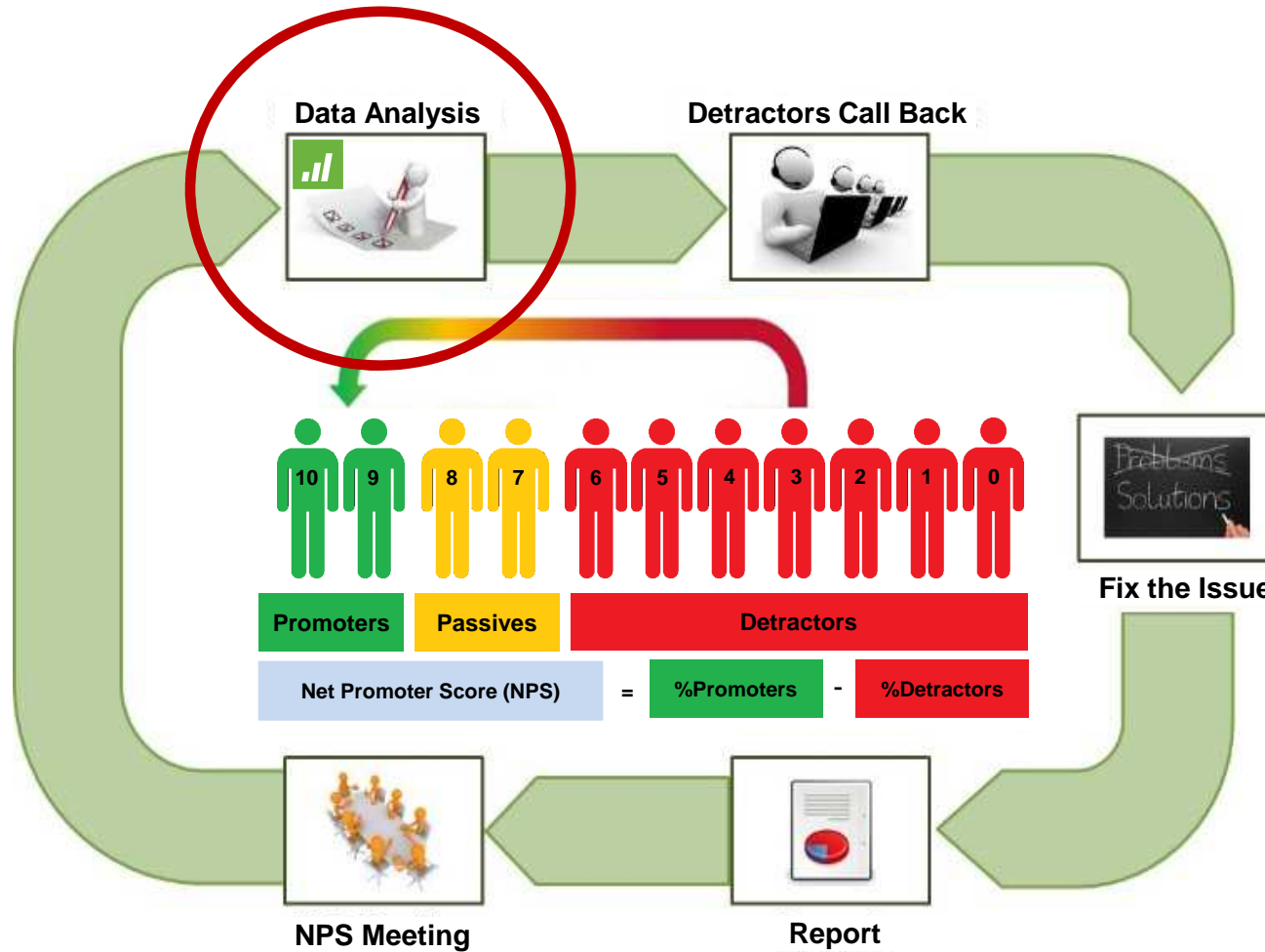
Sample	X	N	Sample p
1	48	747	0,064257
2	19	314	0,060510

Difference = $p(1) - p(2)$
 Estimate for difference: 0,00374747
 95% CI for difference: (-0,0279493; 0,0354443)
 Test for difference = 0 (vs \neq 0): Z = 0,23 P-Value = 0,817

Fisher's exact test: P-Value = 0,891

There is no statistically significant difference between two proportions

NPS PROCESS IN ARISTON



***Achieving Our Quality Vision
By Listening To Our Customers***



BENEFITS

- ➔ Easy application of Minitab in wider contexts
- ➔ Increase technical skills with your manager and colleagues
- ➔ Save money





AUTORE:
EMG Acqua

COMMITTENTE / ACQUIRENTE:
LA7 SPA

CRITERI SEGUITI PER LA FORMAZIONE DEL CAMPIONE:
CAMPIONE RAPPRESENTATIVO DELLA POPOLAZIONE ITALIANA
MAGGIORENNE PER SESSO, ETÀ, REGIONE, CLASSE D'AMPIEZZA
DEMOGRAFICA DEI COMUNI

METODO DI RACCOLTA DELLE INFORMAZIONI:
RILEVAZIONE TELEMATICA SU PANEL

**NUMERO DELLE PERSONE INTERPELLATE, UNIVERSO DI
RIFERIMENTO, INTERVALLO FIDUCIARIO:**
UNIVERSO: POPOLAZIONE ITALIANA MAGGIORENNE;
CAMPIONE: 1.785 CASI; INTERVALLO FIDUCIARIO DELLE STIME: +/- 2,3%;
TOT. CONTATTI: 2.000 (TASSO DI RISPOSTA: 89%);
RIFIUTI/SOSTITUZIONI: 215 (TASSO DI RIFIUTO: 11%)

PERIODO IN CUI È STATO REALIZZATO IL SONDAGGIO:
14 - 15 MAGGIO 2016.
PER INFO COMPLETA: www.sondaggipoliticoelettorali.it



Thank You!

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