
A6: Visualization of Data

Important:

Familiarizing oneself with the background material is strongly recommended before doing the tasks, **especially if creation of charts in Excel is new to you**. Doing the exercises in a computer lab on Thursdays/Fridays is strongly recommended especially if it seems difficult to progress.

Make sure you submit the correct documents.

Remember to save your data regularly.

Objectives of the Exercise

This exercise focuses on diagrams and visualizations of different types of data. Simple procedures of image processing are introduced as well. After completing the exercise, the student will

- know how to search, save and format data from different types of openly available sources
- know how to create bar charts, pie charts and line charts in Excel and format them.
- know how to format the brightness, contrast and resolution of a picture
- know how to combine pictures and make a collage

Tasks and Grading of the Exercise

The exercise has 4 tasks. The maximum total points for the exercise are 10 points.

Task 1 Bar chart (2 p)

Task 2 Pie chart (2 p)

Task 3 Line chart

Task 4 A chart and image processing (4 p)

What needs to be submitted?

2 documents of which the first one is a pdf file containing the answers to the tasks 1,2, and 3. The second document should be a jpg file (a picture) containing the answer to the task 4. The files are named as:

A6T1-T3.pdf
A6T4.jpg

At first

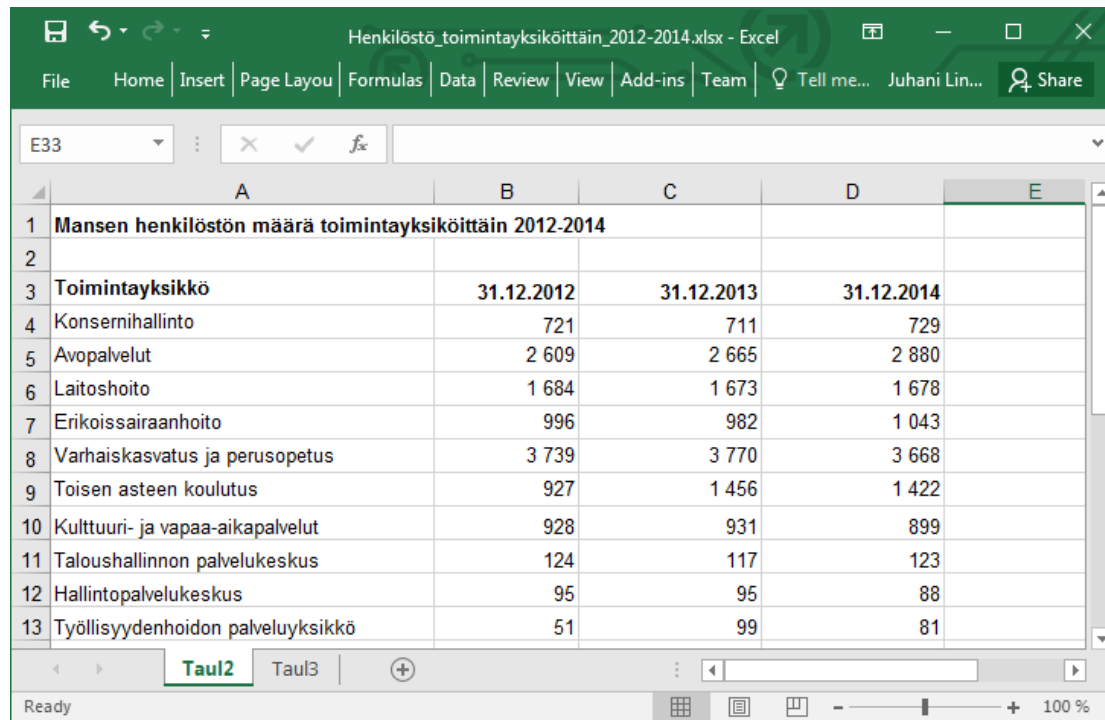
The exercise focuses on charts created with Excel. Ready charts need to be attached to a Word-document (tasks 1, 2 ja 3) or to an image processing program (task 4). Therefore, you will need 3 programs: Excel, Word and an image processing program.

First, open Word and type on the first page a sentence in which you tell where you are at, which operating system and which programs you completed the task. For example: *Done in a computer lab B1084, with Windows 10 (operating system) and Word 2016, Excel 2016 ja GIMP 2.8 (programs).* Save the file as A6T1-T3.docx.

For task 4, you will need the zipped background data **A6-pohjatiedostot.zip**. **The zip file can be found on the course material website under the assignment as well.** Download it on your computer and extract (extracting files was discussed towards the end of Theme 1 background material).

Task 1 (2p): Bar chart

Open the Excel file in the background material (A6-pohjatiedostot.zip). The background data discusses the number of city's employees by their functional unit in 2012-2014. The file name is **Henkilöstö_toimintayksiköittäin_2012-2014.xlsx**. Save it as A6T1.xlsx. At this point the table looks roughly like the one below:



	A	B	C	D	E
1	Mansen henkilöstön määrä toimintayksiköittäin 2012-2014				
2					
3	Toimintayksikkö	31.12.2012	31.12.2013	31.12.2014	
4	Konsernihallinto	721	711	729	
5	Avopalvelut	2 609	2 665	2 880	
6	Laitoshoito	1 684	1 673	1 678	
7	Erikoissairaanhoito	996	982	1 043	
8	Varhaiskasvatus ja perusopetus	3 739	3 770	3 668	
9	Toisen asteen koulutus	927	1 456	1 422	
10	Kulttuuri- ja vapaa-aikapalvelut	928	931	899	
11	Taloushallinnon palvelukeskus	124	117	123	
12	Hallintopalvelukeskus	95	95	88	
13	Työllisyydenhoidon palveluyksikkö	51	99	81	

Create a bar chart similar to the model chart below using the data in the file and attach it as a picture to your Word-document A6T1-T3.docx as an answer to the task 1. The chart doesn't need to be exactly the same. Just make sure that:

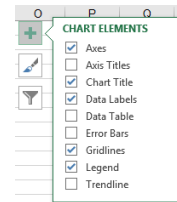
- The chart has the years 2012 and 2014 and only them. [Tip 1](#)
- The chart is a bar chart and the data series of the years 2012 and 2014 are presented with different colors. [Tip 2](#)
- The values of the data series are seen at the ends of the bars on the right side. [Tip 2](#)
- There is a title above the bars "Mansen henkilöstön määrä toimintayksiköittäin 2012 ja 2014" (you may write it in English "Tampere staff by functional unit in 2012 and 2014"), and underneath a *legend*, that states the value series to be from the dates 31.12.2014 and 31.12.2012. [Tip 2](#)

Attach the chart as a picture to the document (A6T1-T3.docx) [Tip 3](#)

Task 1 solution: a picture of a bar chart attached to the document as a response.

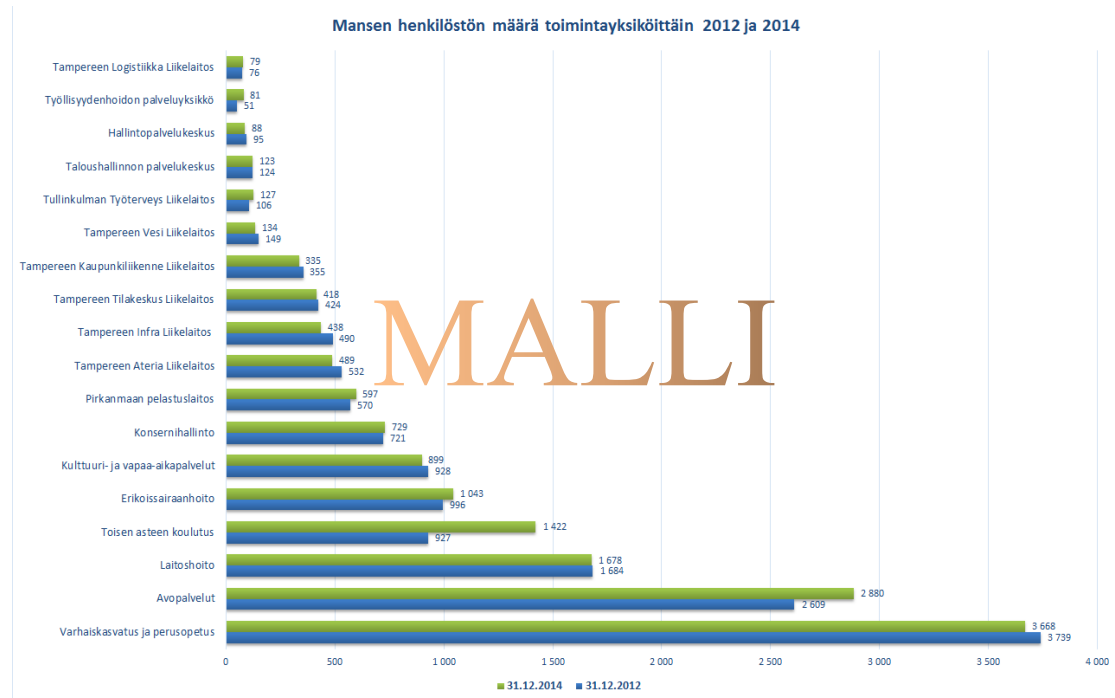
Tip 1. Select the names of the data series in the chart (A3:A21) as well as the titles of the data series from the years 2012 and 2014. It is easier to create charts of areas containing the same number of rows and columns. Therefore, select the empty cell A3 as well. Separate areas can be selected by holding down the ctrl key while painting (in MacOS ⌘-key).

Tip 2. Once the chart has been created, its layout can be quickly formatted with the help of the chart tools *Design* and *Quick Layout*. Try it. The chart elements can be selected by the green plus sign on the right side of the chart (see picture on the right). Elements can be formatted by clicking on them.



Tip 3. Copy the chart as usual (select and copy) but when pasting it, select *Paste as picture*.

Chart 1. Example Chart for Task 1



Task 2 (2p): Pie chart

Search the comprehensive *Statistics Finland: Finland in Figures* website (http://tilastokeskus.fi/tup/suoluk/index_en.html) and select *Elections*-statistics Excel-file regarding the presidential election in 2018 and save it for yourself as A6T2.xlsx (the original name of the table: **suomilukuina_tau_vaa004.xlsx**). At this point the table looks somewhat like this:

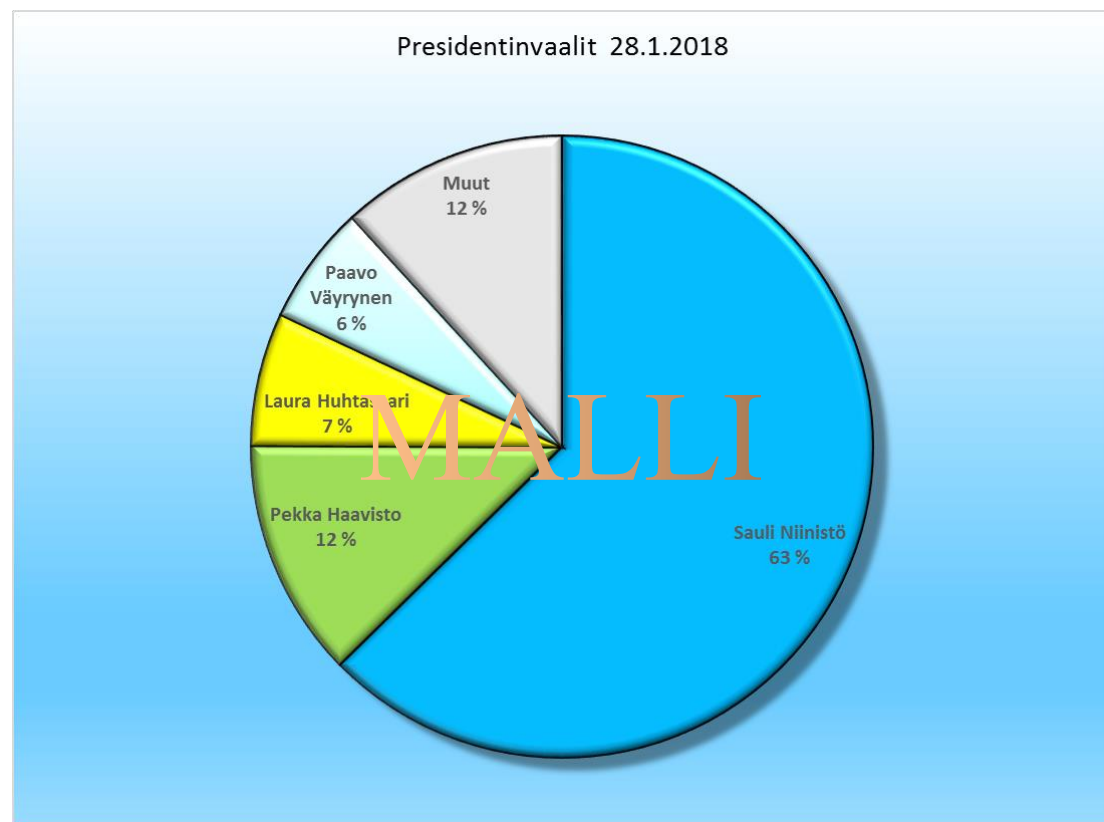
Ehdokas	Äänimäärä	%
Sauli Niinistö	1 875 342	62,6
Pekka Haavisto	371 254	12,4
Laura Huhtasaari	207 337	6,9
Paavo Värynen	185 305	6,2
Matti Vanhanen	122 383	4,1
Tuula Haatainen	97 294	3,2
Merja Kyllönen	89 977	3,0
Nils Torvalds	44 776	1,5
Yhteensä	2 993 668	100

Äänestysprosentti ¹⁾ 69,9 (ulkosuomalaiset ml. 66,8)
Tasavallan presidentiksi valittiin ensimmäisellä äänestyskierroksella Sauli Niinistö
¹⁾ Suomessa asuvat Suomen kansalaiset
Lähde: Tilastokeskus. Presidentinvaalit

Create a pie chart using the data in the file and attach it as a picture to your Word-document A6T1-T3.docx as an answer to the task 2. The chart doesn't need to be exactly the same but make sure that

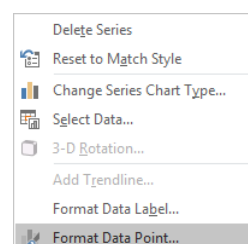
- there are 5 sectors; Sauli Niinistö, Pekka Haavisto, Laura Huhtasaari and Paavo Väyrynen and the rest of the names of the election candidates, that includes the relative number of votes they received. [Tip 4](#)
- The chart is a pie chart and its sectors have the following colors: Sauli Niinistö is blue, Pekka Haavisto is green, Laura Huhtasaari is yellow, Paavo Väyrynen is light blue ja the rest are grey. [Tip 5](#)
- The chart has a title above the circle and the data value, and its names are inside the circle.
- The background color of the chart is any *gradient* shade. [Tip 6](#)

Chart 2. Example Chart for Task 2



Task 2 solution: A picture of a pie chart attached to the document as a response.

Tip 4. There is no ready Rest-data in the table, therefore, it must be created. Add a row above Matti Vanhanen in the A column and name it as Rest and add up the percentages of the below. When creating a chart, select from Sauli Niinistö to the row you've advanced until now.

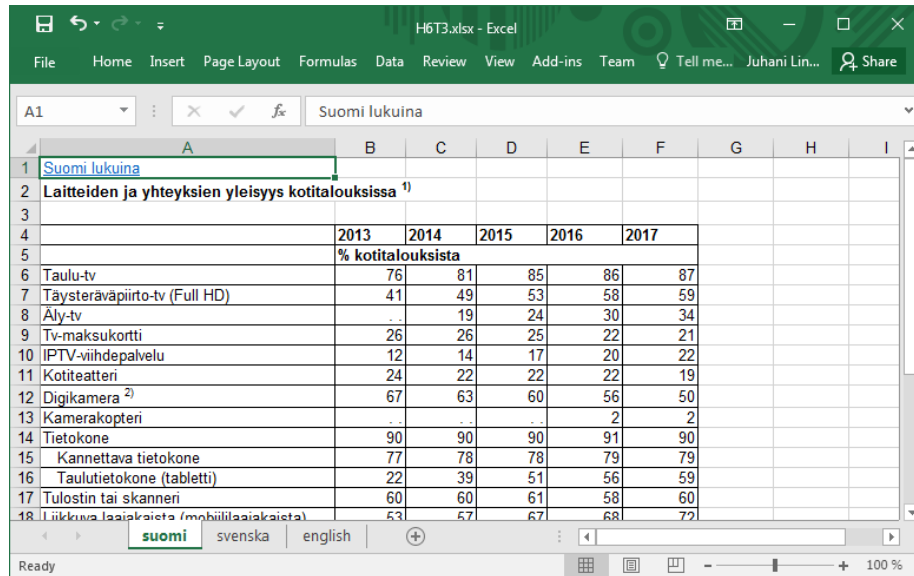


Tip 5. You can format the table elements by clicking. Click a sector once and all the sectors become selected. Click twice and only the sector you clicked upon becomes selected. Right-clicking will bring up the option *Format data point* in the dropdown menu (picture on the left) where you get to define the color of the sector.

Tip 6. As in the tip 5, but now the option is *Format Chart Area*. Select *Fill* and *Gradient fill*.

Task 3 (2p): Line chart

Search the comprehensive *Statistics Finland: Finland in Figures* website (<http://tilastokeskus.fi/tup/suoluk/index.html>) and select *Science, Technology and Information Society* -statistics Excel-file regarding prevalence of equipment and connections in households in 2013 – 2017. Save it for yourself A6T3.xlsx (the original name of the table is **suomilukuina_tau_ttt004.xlsx**). At this point the table should look somewhat like the table below:



	2013	2014	2015	2016	2017
% kotitalouksista					
Täyden palvelun TV	76	81	85	86	87
Täyden palvelun TV (Full HD)	41	49	53	58	59
Äly-TV	19	24	30	34	
TV-maksukortti	26	26	25	22	21
IP TV-viihdepalvelu	12	14	17	20	22
Kotiteatteri	24	22	22	22	19
Digikamera ²⁾	67	63	60	56	50
Kamerakopteri	2	2
Tietokone	90	90	90	91	90
Kannettava tietokone	77	78	78	79	79
Taulutietokone (tabletti)	22	39	51	56	59
Tulostin tai skanneri	60	60	61	58	60
Liikkuva laajakaista / mobiililaajakaista	63	67	67	68	72

Create a line chart using the data in the file and attach it as a picture to your Word-document A6T1-T3.docx as an answer to the task 2. The chart doesn't need to be exactly the same but make sure that

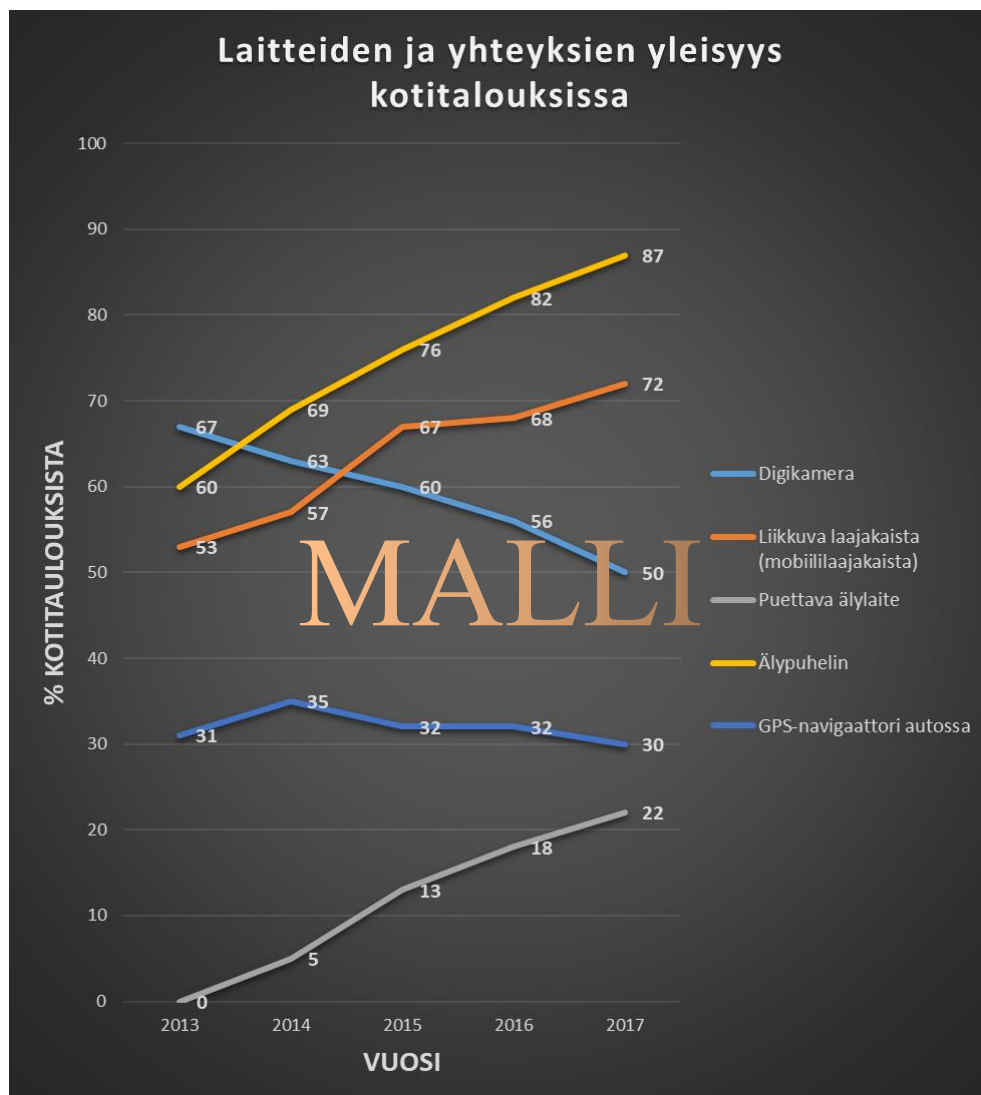
- The chart shows information for 5 devices (and only for them): Digital camera, mobile broadband, wearable smart device, smart phone and GPS car navigator.
- The chart has a title, a legend and its axels have a name as well (% households and year). Legend is on the right side.
- Texts should be light colored with a dark background.
- The values of the data points need to be visible next to the line (as in the picture, for example, with a smart phone 60, 69, 76, 82, and 87).

There are no tips for this but the procedure is similar to the one in tasks 1 and 2.

After the task 3 save the Word-document as A6T1-T3 as a pdf file and submit this document in Weto.

Task 3 solution: A picture of a line chart attached to the response document. A pdf document of the tasks 1, 2 and 3.

Chart 3. Example Chart for Task 3.



Task 4 (4p): A Chart and Image Processing

Save the chart in task 3 (the line chart on prevalence of equipment and connections in households) as a separate file on your computer. [Tip 7](#) Open this picture as well as the 2 pictures *tausta.jpg* and *robomies.png* you extracted from A6-pohjatiedostot.zip –file, in the image processing program of your choice. The tips of the exercise apply to GIMP 2.8 –image processing program. It is free and available for use. You can also use, for example, Photo Shop or Paint Shop Pro. While formatting the document, save it in the image processing program’s native format (in GIMP. xcf).

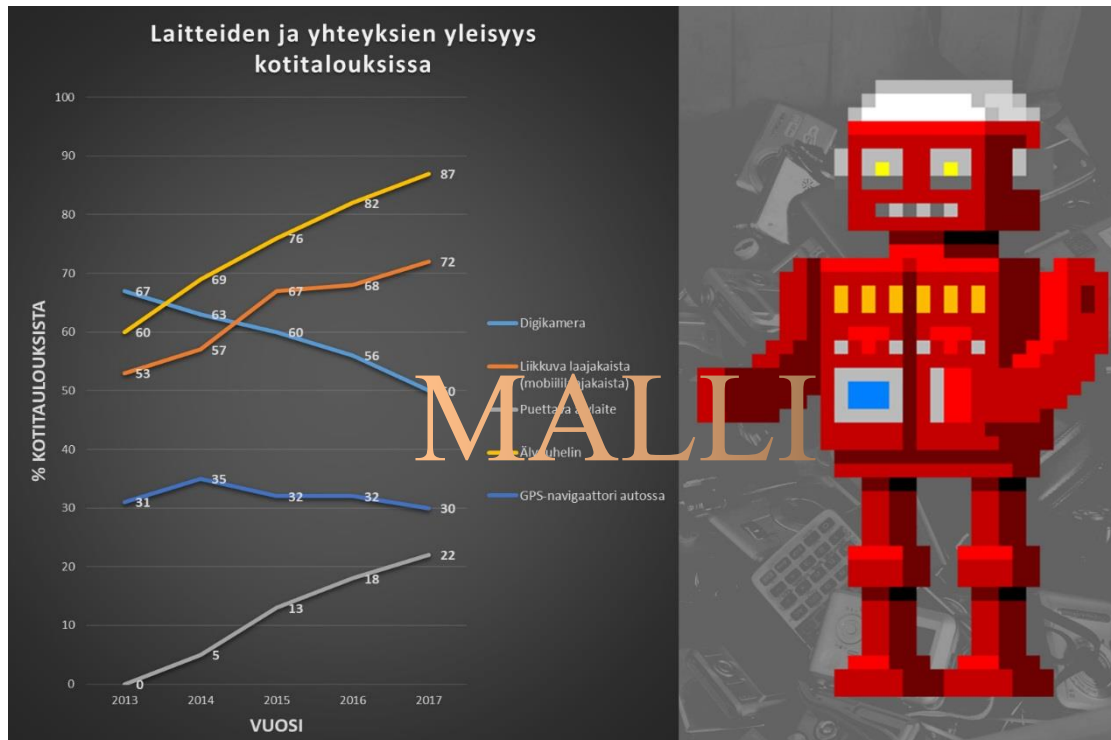
Create a collage of the 3 previously mentioned pictures according to the picture below. Make sure that

- The background picture (*tausta.jpg*) has been formatted as follows: added brightness, less contrast and the picture is monochrome (gray scaled). [Tip 8](#)
- The line chart picture is attached to the left side of the background in color. [Tip 9](#)
- The Robot is attached to the right side of the picture, it is vertically turned, and

it doesn't have a white background. **Tip 10**

d) The robo man is almost as tall as the background and its hands point to the left. **Tip 11**

e) The picture is saved as jpg. **Tip 12**



Task 4 solution: Picture A6T4.jpg

Tip 7. Right-click the picture in your Word file and select *Save as Picture*.

Tip 8. You can adjust the contrast and the brightness in the *Colors* menu and in the submenu *Brightness-Contrast*. In the sample picture, the values are set to 80 (brightness) and -40 (contrast). Grey scaled image is obtained simply by selecting **Image/Mode/Greyscale**.

Tip 9. Change the background picture first to "a color picture" by selecting **Image/Mode/RGB**. Then copy the entire chart picture and paste it as a new *layer* selecting **Edit/Paste as/New layer**. Move if needed to the left marginal with the *Move-tool* (picture on the right).

Tip 10. The "robo man" has to be attached without its white background. Select the "magic wand" (*Fuzzy select tool*, picture on the right) first the background of the robo man and the area between its legs, then invert the selection (**Select/Invert**). Copy the selection and paste it as a new layer on the background picture and move to the left.

Tip 11. The size and the direction of a layer can be altered in the layer menu. The **Scale Layer**-option lets you customize the size of a layer (the robo man's size in the sample picture is 600 x 900 pixels). Layers can be flipped by selecting **Transform/Flip horizontally**.

Tip 12. Pictures need to be exported as jpg in GIMP. Select **File/Export As** and select the file type jpg/jpeg and name it A6T4.