Measuring Digitalization for Sectors and Enterprises

Prof. Dr. H. Altay Güvenir, Director

Bilkent University – TÜSİAD Information Society Forum

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Bilkent Üniversitesi - TÜSİAD

Information Society Forum

- Bilkent University-TÜSİAD Information Society Forum (BTF)
  is a research center formed jointly
  by Bilkent University and
  the Turkish Industrialists' and Businessmen's Association

- Web site: http://btf.bilkent.edu.tr/

Information Society Forum

- The mission of the forum is to
  conduct research and
  perform activities
  for developing medium and long term policies
  towards transforming Turkey
     into an information society.

Need to measure digitalization

- Many Government and Non-Government organizations put efforts to help digitalization

- In order to measure their effects we need metrics

- There are metrics to measure the digital transformation of society
  - Measuring the Digital Transformation: A Roadmap for the Future, *OECD,* March 11, 2019
  - Measuring the Information Society Report 2018, ITU, 2018
  - The Digital Economy and Society Index (DESI), European Commission, September 2019.
  - Toolkit for Measuring the Digital Economy, ITU Digital Economy Task Force, November 2018

Need to measure digitalization

- Similar to the digital transformation of society, **it is necessary for firms to keep up with this transformation** in order to be able to sustain their existence in tough competition conditions.

- Government organization and NGO's are active in contributing to the digital transformation of the business world.

- **The effectiveness of their work needs to be measured** accurately in order to
  - be able to evaluate the results of these activities,
  - monitor the transformation and
  - take the next steps in the right direction.

Need to measure digitalization

- The indexes compare countries in terms of some indicators
- We want to compare, in terms of some dimensions,
  - the sectors, and
  - companies relative to their sectors
- So that,
  - We can determine which sectors to focus on more, and
  - Companies can determine in what dimensions they should invest to improve their digitalization efforts

Need to measure digitalization

- For this purpose, we have developed a score in order to determine the extent to which the enterprises benefit from IT technologies.

- This scoring system is called the "Score for Utilizing Information Technologies", or SUIT for short.

- Available at http://pcaltay.cs.bilkent.edu.tr/~guvenir/BTFS/

Data for SUIT

- We need data representing companies in the whole Country.
- TUIK Conducts a comprehensive survey every year
  - TUIK is Turkish Statistical Institute, member of EUROSTAT.

  Survey: ICT Usage in Enterprises

  We used the results of the surveys conducted in years 2015, 2016 and 2017

Sectors (NACE Rev2)

Code	Sector	NACE Rev.2
S1	Manufacturing	C
S2	Electricity, gas, steam, air conditioning and water supply	D, E
S3	Construction	F
S4	Wholesale and retail trade; repair of motor vehicles and motorcycle	G
S5	Transportation and storage	H
S6	Accommodation, Food and beverage service activities	I
S7	Information and communication	J
S8	Real estate activities	L
S9	Professional, scientific and technical activities	M
S10	Administrative and support service activities	N
S11	ICT Service activities	S

Number of Responders per Sectors

Sector	2015	2016	2017
S1	3429	4051	3979
S2	280	290	352
S3	1171	1663	1296
S4	1714	1994	1296
S5	487	592	577
S6	735	833	861
S7	578	699	710
S8	179	175	294
S9	362	467	452
S10	1046	1221	1310
S11	84	75	75
Total	10065	12060	11833

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Survey Questions

Survey questions are grouped under 6 dimensions:

1. **Employees**, 2 questions
2. **Internet Infrastructure** in the company, 2 questions
3. Use of **E-Government** Systems, 5 questions
4. Use of **Social Media,** 2 questions
5. **Information Sharing** in the company, 4 questions
6. Use of **E-commerce,** 8 questions

In total, 23 questions

Sample Survey Questions

Survey questions are grouped under 6 dimensions:

1. **Employees:**

    1. Does your company employ ICT/IT personnel ?

        Yes: 1, No: 0

    2. Did your company organized training on the use of ICT Technologies to the employees, last year?

        Yes: 1, No: 0

Sample Survey Questions

Survey questions are grouped under 6 dimensions:

4. **Social Media:**
    1. Does your company web page have links to social media pages?

        Yes: 1, No: 0
    2. Does your company use social media applications for internet advertisement?

        Yes: 1, No: 0

Sample Survey Questions

4. Information Sharing:

1. Does your company use ERP (Enterprise Resource Planning) software?

   Yes: 1, No: 0

2. Does your company use CRM (Customer Relationship Management) to use customer information for other Business opportunities ?

   Yes: 1, No: 0

3. Does your company use CRM software to analize customer information for marketing purposes ?

   Yes: 1, No: 0

4. Does your company use SCM (Supply Chain Management) data to share with customers and suppliers?

   Yes: 1, No: 0

Forming the Score Function

- The score function will be based on these survey questions
- It should indicate how much the company utilizes the digital technology
- A company best utilizes any technology if it helps increase the profits
- Each technology, depending on its sector, will help a company increase its profits

- **Task**: Determine how effective each technology to increase the profits for a sector.

Determining the weights of technologies

- Conducted a survey to representative firms from each sector

- Asked how effective each selected question of TUIK survey in increasing the profits,

- Rank on the Likert scale 1 to 5

Sector	# Firms
S1	11
S2	6
S3	11
S4	4
S5	4
S6	4
S7	9
S8	3
S9	4
S10	6
S11	3

Weights of Questions in Dimension

Sector	Employees		Internet Infrastructure		E-Government					Social Media		Information Sharing				E-Commerce							
	F1	F2	F10	F13	F22	F23	F24	F25	F26	F21	F27	F29	F31	F32	F33	F15	F16	F17	F18	F19	F20	F40	F44
S1	52	48	53	47	19	19	18	22	22	51	49	26	25	25	24	17	15	11	11	11	11	13	11
S2	54	46	52	48	18	19	18	23	22	47	53	27	25	25	23	15	15	12	13	12	12	11	10
S3	48	52	52	48	19	19	19	22	21	50	50	26	25	26	23	19	16	12	10	11	10	12	10
S4	51	49	51	49	21	21	20	20	18	52	48	26	25	25	24	14	13	12	12	12	12	13	12
S5	44	56	51	49	21	18	18	21	22	54	46	24	24	26	26	15	14	12	11	12	13	12	11
S6	48	52	50	50	19	20	17	22	22	53	47	23	29	29	19	15	15	14	11	14	8	16	7
S7	49	51	51	49	16	16	18	25	25	51	49	25	28	26	21	16	15	13	12	11	12	11	10
S8	31	69	56	44	22	17	17	22	22	52	48	22	29	31	18	19	17	15	12	8	8	13	8
S9	46	54	51	49	17	16	21	23	23	45	55	25	25	27	23	24	21	9	9	8	8	12	9
S10	41	59	52	48	19	18	19	22	22	49	51	28	26	25	21	22	15	12	11	11	7	15	7
S11	52	48	52	48	16	16	18	25	25	48	52	25	26	26	23	16	12	11	12	12	12	13	12

Weights of Dimensions per Sector

Sector	d=1 Employees	d=2 Internet Infrastructure	d=3 e-Government	d=4 Social Media	d=5 Information Sharing	d=6 e-Commerce
S1	17	20	15	16	18	14
S2	18	21	17	13	18	13
S3	19	20	17	12	19	12
S4	19	19	15	12	19	16
S5	18	19	15	14	17	17
S6	17	20	13	17	16	17
S7	18	19	14	17	17	15
S8	13	20	15	20	18	14
S9	18	25	13	14	18	12
S10	13	23	19	18	14	13
S11	18	20	15	14	17	16

SUIT Function for a firm

- $SUIT = \sum_{d=1}^{6} W_d \, s_d$
- Here,
  - W_d is the normalized weight of dimension *d* for the sector (from table)
  - s_d is the score for the firm for dimension *d*, computed as follows:

- $s_d = \frac{\sum_i w'_i . a_i}{\sum_i w'_i}$

- $w'_i = \begin{cases} w_i & a_i \text{ is known} \\ 0 & \text{otherwise.} \end{cases}$

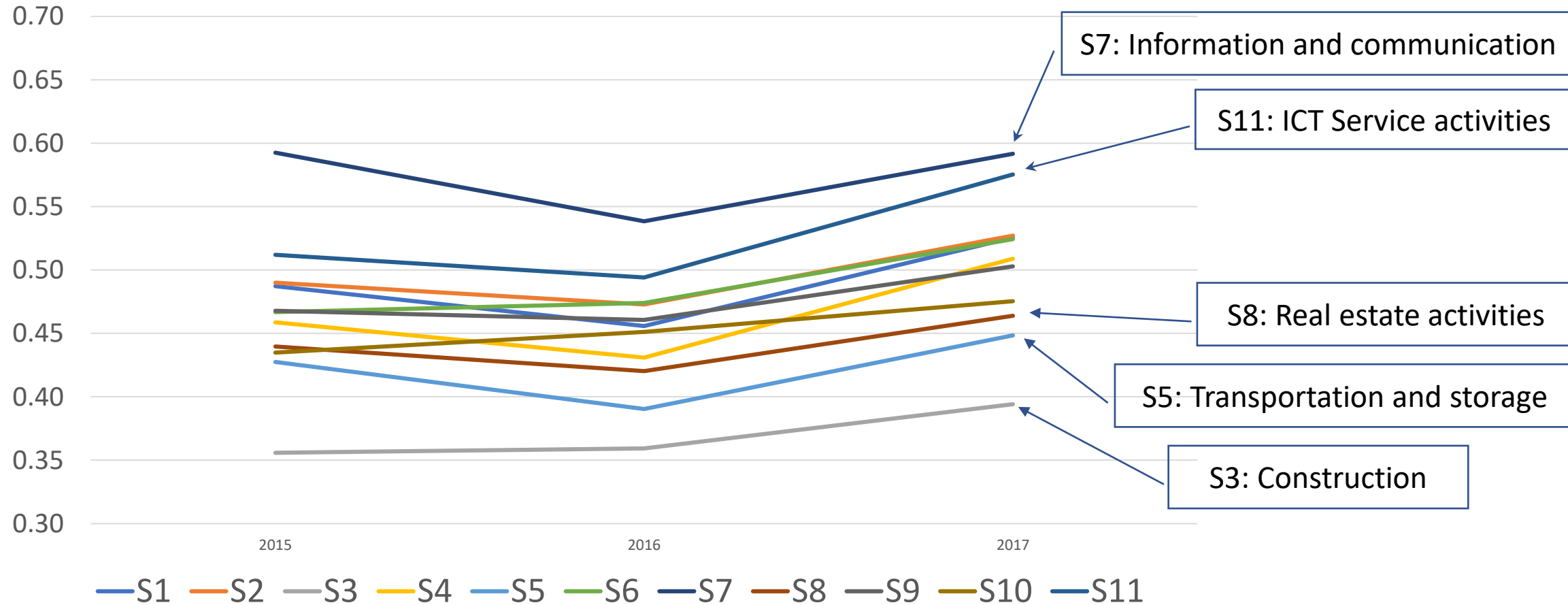w_i is the weight of question q_i
for the sector (from table)
a_i is the answer of question q_i for the firm

Online Score Function for Firms

- Available online
- http://pcaltay.cs.bilkent.edu.tr/~guvenir/BTFS/

- Currently, only in Turkish

Digitalization Score for Sectors

SUIT

S7: Information and communication

S11: ICT Service activities

S8: Real estate activities

S5: Transportation and storage

S3: Construction

—S1 —S2 —S3 —S4 —S5 —S6 —S7 —S8 —S9 —S10 —S11

Reports

- Reports for 2018 and 2019 are available on the web page BTF
- http://btf.bilkent.edu.tr/en/reports/
  - Girişimler İçin Bilişim Teknolojilerinden Faydalanma Skoru 2019
  - Girişimler İçin Bilişim Teknolojilerinden Faydalanma Skoru

The reports are in Turkish

- Questions / Comments