Cross-Cultural Issues Related to Open Innovation in High-Tech Companies from Japan, Romania, Tunisia and Turkey

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Abstract

This paper aims to emphasize the gaps between the cultural profiles of high-tech companies from Japan, Romania, Tunisia and Turkey in the context of open innovation approach. The goal is to assess the cultural profiles of the firms included in the sample, by determining a percentage distribution of Technology Isolationists, Technology Fountains, Technology Sponges and Technology Brokers. The questionnaire was implemented through structured interviews conducted within 100 companies from each country. The findings show that in the case of Japanese high-tech firms there are no significant differences within their distribution in these four clusters, while in Tunisia and Turkey the Technology Brokers are placed on the first place and in Romania the majority of the high-tech firms are assigned to Technology Sponges.

Keywords: *open innovation, cultural profile, technology isolationist, technology sponge, technology broker, technology fountain*.

JEL classification: O32, M14.

Introduction

In the actual hypercompetitive environment, valuable ideas and technologies do not need to be the result of the own firm R&D capabilities and the release of those ideas and technologies into the market does not need to be accomplished by the firm's own marketing activities. In order to generate radical innovations and/or build new businesses, firms are quite often depending on externally developing knowledge sources. This pressing need to integrate external R&D resources has prompted many firms to shift from a closed innovation model

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to an open innovation model, using external ideas and knowledge in conjunction with internal R&D to achieve and sustain innovation (Chesbrough, 2003). The six F-s (Flexibility; Followers; Force & Firmness; Facilitator and Feelings' Intelligence) of leadership mix concept (Nastase and Barbu, 2011) has a positive impact on the organizational orientation towards open innovation processes.

Open innovation has the role to redefine the way businesses develop and source knowledge to innovate. Although open innovation is a holistic approach to innovation, cultural challenges can be found in the case of companies from all over the world. This is the main reason for which companies are facing difficulties during the implementation of the open innovation concept (Herzog and Leker, 2010). The practitioners in this field consider that there is a great need to bridge the gaps of research on Open Innovation culture at the theoretical and empirical level. The major features of innovation culture, such as encouragement of risk taking, openness to new ideas, failure tolerance, emphasis on learning, and openness to constructive dissent, have been already identified (Herzog, 2011).

The implementation of an open innovation strategy could be affected by the employees' attitudes that favour internal innovation. Specifically, some companies' corporate cultures are characterized by "not invented here" syndrome. Employees with "not invented here" tendencies do not want to acquire technology from external sources as they consider that it is better to focus on internally developing innovative products or services. "Not sold here" syndrome describes similar negative attitudes found in companies' corporate cultures regarding the transfer of their technologies. These behaviours may result from the fear of strengthening the competitors by licensing or selling competitively relevant technologies (Lichtenthaler et al., 2011). This paper is an empirical investigation of the links between open innovation orientation and cultural profiles in the case of a sample formed by 400 high-tech companies equally distributed in four countries (Japan, Romania, Tunisia and Turkey) having different economic backgrounds and implicitly innovation initiatives.

1. Peculiarities of open innovation in Japan, Romania, Tunisia and Turkey

As the literature related to open innovation reveals few empirical evidence on cross-cultural surveys focused on the assessment of companies' cultural profiles in the context of open innovation practices, our comparative analysis seeks to emphasize the distribution of different cultural profile clusters in four countries where we conducted our survey: Japan, Romania, Tunisia and Turkey. However, we firstly illustrate some peculiarities of open innovation in these countries before the statistical analyses.

Open innovation, characterized by using not only in-house but also external R&D resources (Chesbrough, 2003), is steadily making strides in **Japan** as a whole. Many have described Japan's system of innovation as being in-house-oriented and mainly driven by large corporations, but external collaboration in

R&D has been picking up in Japan since around the year 2000. Conducting all required R&D internally is prohibitive in mainly high-tech industries, so shifting to an open innovation model is becoming a pressing issue for Japanese companies. What is vital for Japanese firms is to incorporate into their technology management both of the key elements – maintaining expansive R&D activities that do not sacrifice future growth potential through open innovation, and breaking into new growth markets through "globalization". (Motohashi, 2011).

The Innovation Network Corporation of Japan (INCJ) was launched in 2009 as a public-private partnership between the Japanese government and major corporations. INCJ makes investments aimed at fostering "flow of technology and expertise beyond the boundaries of existing organisational structures"- be they start-up companies, medium-sized enterprises or large, established firms and at building an ecosystem of open innovation. Not-invented-here mentality is a psychological barrier to foster innovation across boundaries, and INCJ's undertakes a variety of activities to actively counter these tendencies in order to facilitate/generate successful innovations and partnerships (Lippitz, 2012).

The cooperation between long-term firms is already formed in Japanese firms, and SMEs with high module technology play the important role and supported open innovation. The partners succeeded in open innovation with such firms are not procured from the open market, but from the long-term relationship (Idota et al., 2012).

Embraced by the European integration opportunities, the companies from **Romania** massively invested in distribution, according a smaller importance to production and R&D activities. A significant lag behind is registered still in open innovation and technology transfer. If in the most developed countries university innovation means over 50% revenues, in Romania, technology transfer, spin offs and acquisition of innovative companies are almost inexistent. Their open innovation experience and know-how of research centres of the universities are still missing and the trust of the business environment in their competences is also low (Borcea and Fuica, 2012). Therefore, it is crucial for entrepreneurs to develop a description of the desired future goals that are clear, measurable, and challenging since it will give them an overall picture of where they are going, what they want to achieve, and how they are going to compete (Ahmad & Halim, 2012)

Romania's innovation performance remains, however, very weak compared to other EU countries. Romania is part of the 'catching–up' group of countries, displaying on the one hand a positive economic trend based predominantly on low cost labour and low value-added exports, and on the other, a low level of innovation infrastructure and mechanisms, which are still at an early development stage and do not contribute significantly to economic growth. According to the results of a survey posted on the website: *http://www.proinno-europe.eu/ page/innovation-and-innovation-policy-romania*, the innovative profile of Romanian firms is still very low: over 80% of non-innovator firms, next to approximately 10% of intermittent innovator firms and a small percentage of strategic innovator, adopter and modifier firms. Innovative firms account for less

than a fifth of the country's total number of active firms and workforce. Innovative firms are predominantly SMEs and operate mainly in industry, while the rest are active in services (trade, real estate, transport and communications). This situation is to a large extent the result of a very low level of public funding of innovation, with only 10% of innovative firms receiving funding, and very low levels of innovation expenditures, which don't exceed 3% of innovative firms' turnover. Although significant progress has been made in order to foster the weak innovation culture in the country, further measures are needed to increase application of R&D results by business and to turn innovation into a driver of national competitiveness.

In the context of financial crisis, the straightening plan will provide supplementary support to the infrastructure investments and energetic efficiency, to the environment protection measures and installations (Neculita and Sarpe, 2010).

More specifically for the case of **Tunisia**, the issue of innovation is particularly important, since the Tunisian public policies in the recent period have been quite remarkable in their ambition to increase the innovative capacity and the competitiveness of domestic firms, while they opened the domestic market to foreign firms. From open innovation perspective, the aspects related to the innovativeness of subcontractors leads to important questions on the relevance of this strategy and its rationale for the future, especially now that Tunisian organisations will live through new opportunities and choices (Rahmouni et al., 2011).

The main pillars of the Tunisian National Research System are the universities (laboratories and research units), research public institutions, techno-poles and competitiveness poles. The government encourage the public and private institutions and research associations to participate to the scientific research and technological development projects (Ben Miled-M'rabet, 2012).

Turkey has an established manufacturing system comparable to many developing countries. Although existing production value chains would benefit from low-labour cost, its manufacturers cannot continue competing without developing capabilities in research and development, design, and innovation. That is why new models such as open innovations and building technological partnerships might take Turkey into a new development track (Cetindamar and Ulusoy, 2008).

A study conducted in Turkey in view to collect information from enterprises on methods of innovation and open innovation that are practiced inside them showed that open innovation awareness in top Turkish companies is still very low. In addition, there seems to be no relationships, at least for now, between some of the firm characteristics such as size and age and innovation awareness (Gumus, 2011).

2. Research methodology

Our main goal is to assess the cultural profiles of high-tech companies from the four countries which participate to the cross-cultural survey, by taking into account the open innovation approach.

The four clusters of firms defined by different cultural patterns regarding open innovation (Lichtenthaler et al., 2011) are represented by the Technology Isolationists, characterized by high levels of both "not invented here" and "not sold here" syndromes, Technology Fountains, characterized by high level of "not invented here" syndrome and low level of "not sold here" syndrome, Technology Sponges, characterized by low level of "not invented here" syndrome and high level of "not sold here" syndrome and Technology Brokers, characterized by low levels of both "not invented here" and "not sold here" syndromes (figure 1).

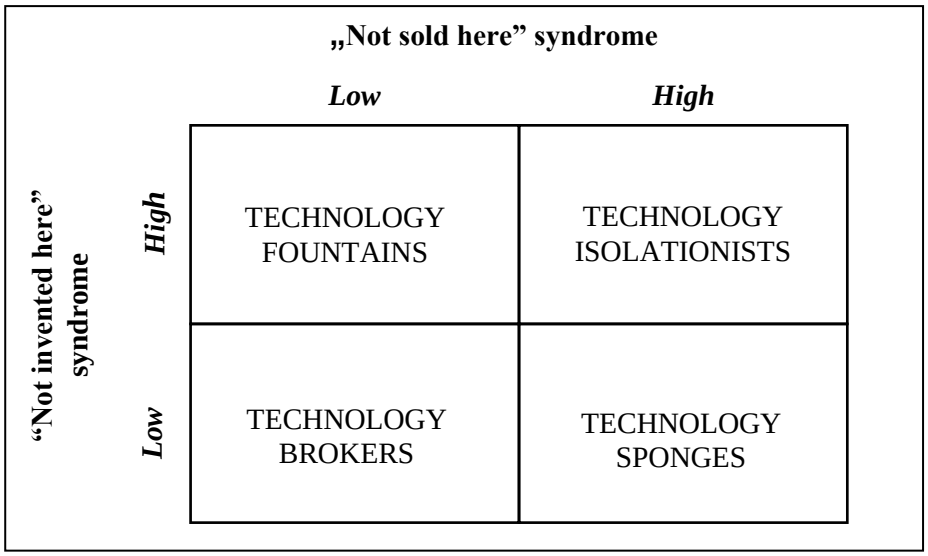

Figure 1 Four clusters of open innovation cultural profiles (Lichtenthaler et al., 2011)

We designed and developed a 20 items questionnaire which was addressed to a sample of 100 high tech companies' managers from each target country. We grouped the questions (items) in four categories, corresponding to the four types of open innovation cultures.

The five items focused on Technology Fountains illustrate a low attractiveness for external technology sourcing and implicitly a high degree of independence of technology to different providers, associated with a high interest for commercialization strategy of the company's internally developed technologies, without being concerned of losing control over them.

The five items focused on Technology Sponges emphasize an improvement of the internal innovation process by means of acquiring technology from external sources as a result of competitive intelligence mechanisms, correlate with internal agreements which don't allow the IP transfer to other companies.

The five items focused on Technology Brokers reveal the situations in which companies precede to external technology acquisitions in order to the improve the R&D process and internal technology selling in view to provide additional revenues.

The five items focused on Technology Isolationists highlight the situations in which companies benefit from the technologies developed internally and detain the full control on their intellectual property, preventing the fact that other organizations could make profit from their technologies.

We assigned to each question a scale with five attributes, allocating five points to "Strongly agree", four points to "Agree", three points to "Neutral", two points to "Disagree" and one point to "Strongly disagree". Then, we introduced the score of each item and when we have entered all the scores for each question; the last operation was represented by the determination of the total number of points corresponding to the four clusters of cultural profiles.

The questionnaire was distributed to a convenience sample represented by 400 managers of high-tech companies from the four target countries, receiving and validating 100 answers per country.

Due to the peculiarities of high-tech sectors from each country and especially to the managers' agreement to fill this questionnaire, there are differences in the sample's structure in the target countries. In Japan, we took into consideration answers from two sectors: manufacturing (67%), IT & software (33%); in Romania, the companies were distributed in diverse sectors as manufacturing (26%); information technologies (23%), telecommunication (14%); electronics (12%); food (14%); chemical (10%); and others (15%); in Tunisia, the answers was provided by managers from manufacturing sector (35%), Information technology (45%) and pharmaceutical industry (20%), while in Turkey the respondents belong to diverse sectors: machinery and manufacturing (24%); chemical (12%); automotive (10%); healthcare (9%); materials (7%); information technologies (13%); food (14%); telecommunication (4%); and others (7%) such as electronics, construction, petroleum and pharmaceutical.

3. Data analysis

The results of the survey focused on the assessment of the open innovation cultural profiles related to the companies included in the research sample will be firstly analyzed for each country, in order to provide the relevant information necessary to the comparative analyses.

The percentage distribution of the four clusters assigned to open innovation cultural profiles was calculated by taking into account the total number of points accumulated in the four columns of the table designed for each country.

In the case of **Japanese** companies' sample, we remark minimal differences between the total number of points assigned for each column (Table 1), which will contribute to a balanced distribution of the percentages associated to the four clusters of cultural profiles: Technology Fountains - 24,29%, Technology Sponges - 25,33%, Technology Brokers - 24,64% and Technology Isolationists - 25,74% (Figure 2).

Table 1 Distribution of the scores related to 20-items questionnaire applied in Japanese companies

Item	Score	Item	Score	Item	Score	Item	Score
1	291	2	313	3	288	4	342
5	260	6	317	7	328	8	281
9	316	10	306	11	301	12	337
13	280	14	308	15	288	16	269
17	310	18	275	19	273	20	315
TOTAL	1457	TOTAL	1519	TOTAL	1478	TOTAL	1544
	TECHNOLOGY FOUNTAINS		TECHNOLOGY SPONGES		TECHNOLOGY BROKERS		TECHNOLOGY ISOLATIONISTS

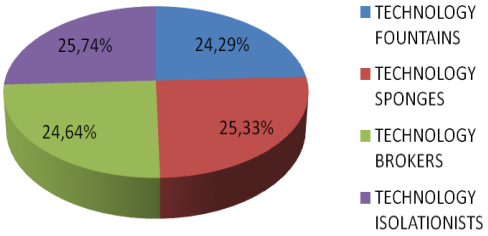

Figure 2 Japanese companies' cultural profiles from open innovation perspective

The results might be surprising at first view, as we attended that the percentage of Technology Brokers overcomes the rest of the companies included in the other clusters. In the same time, we are conscious that a significant number of Japanese high-tech companies, well known all over the world as leaders in innovation, are heavily relying on their own technological competencies and are trying to prevent that other organizations could make profit from their R&D expertise. These are the main reasons which lead to an approximate equal distribution of the four clusters in the case of Japanese firms included in the research sample, revealing a moderate level of both "Not invented here" and "Not sold here" syndromes.

In the case of **Romanian** companies' sample, the Technology Sponges are placed on the first position - 28,24%, followed by Technology Fountains - 25,87%, Technology Isolationists – 25,30% and Technology Brokers – 20,59% (Table 2 & Figure 3).

Table 2 Distribution of the scores related to 20-items questionnaire applied in Romanian companies

Item	Score	Item	Score	Item	Score	Item	Score
1	302	2	368	3	243	4	341
5	318	6	369	7	254	8	285
9	343	10	334	11	285	12	319
13	301	14	357	15	263	16	310
17	362	18	347	19	249	20	335
TOTAL	1626	TOTAL	1775	TOTAL	1294	TOTAL	1590
	TECHNOLOGY FOUNTAINS		TECHNOLOGY SPONGES		TECHNOLOGY BROKERS		TECHNOLOGY ISOLATIONISTS

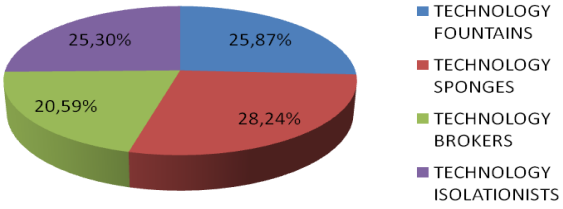

Figure 3 Romanian companies' cultural profiles from open innovation perspective

The lowest percentage assigned to Technology Brokers reflects a reality of the Romanian companies' corporate cultures, which are mainly focused on closed innovation, as a result of the fear to lose the competitive advantages by collaborating with other firms in what concerns the R&D issues. Concerning the highest rate assigned to Technology Sponges, we remark the managers' initiatives to improve the internal innovation process by acquiring technology from external sources, but in the same time, their attitude to external knowledge exploitation is rather negative.

In the last decade, we observed positive developments in what concerns the orientation towards innovation cultures in Romania, facilitated by the decentralisation of the decision-making system, improvements in the innovation legal framework, consolidation of the R&D system and slow-down of the brain drain.

In the case of **Tunisian** companies' sample, first position belongs to Technology Brokers – 28,31%, while the Technology Sponges are placed on the second position – 26,93%; Technology Isolationists acquired 22,89%, while Technology Fountains – 21,87% (Table 3 & Figure 4). These results emphasize lower rates of "Not invented here" and "Not sold here" syndromes in the majority of the firms included in the sample, which prove the cultural orientation of these high-tech companies towards networking.

Table 3 Distribution of the scores related to 20-items questionnaire applied in Tunisian companies

Item	Score	Item	Score	Item	Score	Item	Score
1	249	**2**	380	**3**	375	**4**	250
5	255	**6**	345	**7**	335	**8**	260
9	257	**10**	280	**11**	260	**12**	220
13	290	**14**	300	**15**	295	**16**	340
17	220	**18**	260	**19**	380	**20**	260
TOTAL	**1271**	**TOTAL**	**1565**	**TOTAL**	**1645**	**TOTAL**	**1330**
	TECHNOLOGY FOUNTAINS		TECHNOLOGY SPONGES		TECHNOLOGY BROKERS		TECHNOLOGY ISOLATIONISTS

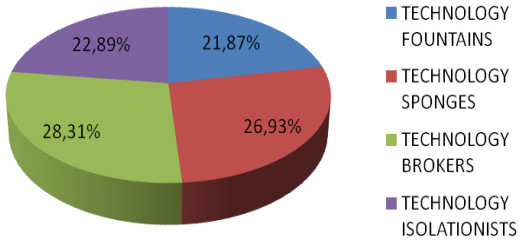

Figure 4 Tunisian companies' cultural profiles from open innovation perspective

Even if the economic and political crisis affected Tunisian high-tech companies' competitiveness in the global market, their managers are aware of the opportunities related to the implementation of open innovation and will be able to face the challenges associated to this approach.

In the case of **Turkish** companies' sample, the Technology Brokers are placed on the first position - 26,64%, followed by Technology Isolationists - 26,09%, Technology Fountains – 23,79% and Technology Sponges – 23,48% (Table 4 & Figure 5).

Table 4 Distribution of the scores related to 20-items questionnaire applied in Turkish companies

Item	Score	Item	Score	Item	Score	Item	Score
1	293	**2**	308	**3**	350	**4**	324
5	318	**6**	302	**7**	368	**8**	297
9	317	**10**	315	**11**	356	**12**	352
13	314	**14**	346	**15**	326	**16**	354
17	311	**18**	262	**19**	339	**20**	376
TOTAL	1553	**TOTAL**	1533	**TOTAL**	1739	**TOTAL**	1703
	TECHNOLOGY FOUNTAINS		TECHNOLOGY SPONGES		TECHNOLOGY BROKERS		TECHNOLOGY ISOLATIONISTS

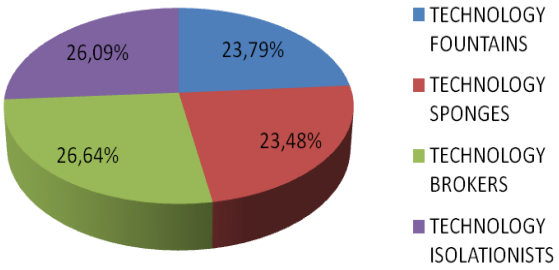

Figure 5 Turkish companies' cultural profiles from open innovation perspective

The effects of the regulations which promote innovation and provide improved conditions for innovative firms in Turkey had a double effect: on the one hand, the open innovation was encouraged in the high-tech firms which are focused

on collaborative R&D projects; on the other hand, an important number of high-tech companies from this country aimed at protecting their innovative potential in order to maintain or improve their competitive position.

Conclusions, limitations and future research agenda

A proper understanding of the role of the high-tech companies in a cluster of open innovation requires a deep understanding of the relationships among R&D departments in a collaborative network where the cultural patterns are focused on the elimination of "Not invented here" and "Not sold here" attitudes.

While much remains to be explored, this research provides a contribution to cross-cultural comparative analyses by shedding new light on the open innovation environments from four countries with high cultural gaps and different economic situations: Japan, Romania, Tunisia and Turkey.

Technology Brokers radically reinvents the innovation process in the countries where the majority of high tech companies belong to this cluster. These companies facilitate the collaborative R&D expertise by bringing together the collective experience and capabilities of people both inside the organization and beyond, bridging traditional communications boundaries and delivering innovative products or services to their customers. By improving the development of new prototypes and technologies, the open innovators from these four countries achieve higher profitability from their innovation investments as they are oriented to provide high customer value.

The main limitation of our survey is represented by the lack of homogeneity within the structure of the convenience sample that we used in our analyses. A future research direction will be focused on finding relevant answers to the issues reflecting how the organizational cultural gaps would influence the implementation of open-innovation strategies between partners from different countries.

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Appendix

QUESTIONNAIRE
IDENTIFICATION OF OPEN INNOVATION CULTURAL PROFILES OF HIGH-TECH COMPANIES FROM JAPAN, ROMANIA, TUNISIA AND TURKEY

Item no.	Item
1	External technology sourcing is less attractive for our company, but we are interested in developing a commercialization strategy for our technologies.
2	We are constantly seeking information on technological developments in our domain using competitive intelligence techniques; in the same time, we are aware of losing control on our technology if we licence it to the business partners, which could be transformed in competitors.
3	We allow some of our ideas and technologies to be used by other companies, in view to assure the financial resources for acquiring external technologies.
4	As we hired high-skilled and creative employees within our R&D department, we can benefit from the technologies developed internally and we should control our intellectual property, so that our competitors don't take advantage of our ideas.
5	We would rather develop a technology on our own efforts than being dependent on different providers; in the same time, we are looking for external ways to sell or licence our technologies in order to increase the company's revenues.
6	We think that we could improve our internal innovation process if we acquire technology from external sources, but we will never sell or transfer our technology to third-parties.
7	The external technologies allow us to manage the strategic experiments at lower levels of risk and resources; in this way, we try to build long term relationships with external innovators and potential customers for the technologies developed by our R&D department.
8	Acquiring external technologies could frustrate our R&D specialists, as their expertise is not exploited at its full potential, while selling or licensing our technologies could weaken our business core competencies.
9	In order to improve our competitive position, we consider that relevant technologies for our business must be internally developed; furthermore, we will be able to apply the most appropriate marketing techniques in view to sell our technologies to third-parties.
10	Our company is actively involved in several collaborations based on the development of innovative technologies and our agreement doesn't allow the transfer of the intellectual propriety to external partners.
11	We are scanning permanently the technological environment by means of competitive intelligence techniques in order to find inventors that could be the source for internal innovation.
12	We appreciate the innovative efforts of our R&D specialists in view to internally discover and develop technologies and we must prevent other organizations to make profit from our company's ideas and technologies.

13	We are focusing our R&D expertise in view to conceive performing technologies, being less concerned of losing control over technologies if we intend to market them.
14	We consider external knowledge as valuable as the knowledge generated by our specialists from R&D department, while the results of the application of our knowledge workers' expertise shouldn't be sold or rented, even if the additional revenues are high.
15	In our vision, the external technology acquisition leads to the short cutting of the R&D process, while internal technology selling provides additional revenues.
16	We develop incentive programs within our R&D department based on the reward of the employees who discover innovative technologies.
17	Even if we have positive experience related to the increase in revenues from out-licensing our technologies, we are still reticent to apply technologies from outside.
18	Our employees have a positive attitude to external knowledge acquisition, but their attitude to external knowledge exploitation is rather negative.
19	We develop incentive programs focused both on the acquisition of innovative technologies which fit our business needs and on the selling of technologies that otherwise are unused in our business model.
20	We want to have the full internal control of the innovation; in this way, we consider that technology must be invented, developed and protected by our company.

RESULTS

Item no.	Strongly agree (5)				Agree (4)				Neutral (3)				Disagree (2)				Strongly disagree (1)			
	JP	RO	TN	TK	JP	RO	TN	TK	JP	RO	TN	TK	JP	RO	TN	TK	JP	RO	TN	TK
1	3	12	10	10	23	17	17	24	48	36	15	28	14	31	28	25	12	4	30	13
2	5	29	35	13	35	23	30	18	37	38	20	44	14	7	10	14	9	3	5	11
3	1	8	40	11	26	13	30	44	42	26	5	31	22	20	15	12	9	33	10	2
4	16	27	5	19	37	19	20	17	27	31	15	37	13	14	40	23	7	9	20	4
5	1	25	10	12	14	23	20	31	39	16	10	28	36	17	35	21	10	19	25	8
6	5	21	20	8	30	40	35	23	45	27	20	42	17	11	20	17	3	1	5	10
7	6	6	25	18	34	18	30	47	46	25	10	20	10	26	25	15	4	25	10	0
8	2	7	10	12	18	21	20	22	44	32	10	25	31	30	40	33	5	10	20	8
9	4	19	8	10	27	35	25	32	52	23	10	29	15	16	30	23	2	7	27	6
10	2	26	15	11	21	25	25	26	60	19	10	37	15	17	25	19	2	13	25	7
11	2	11	10	27	25	19	15	24	50	36	20	30	18	12	35	16	5	22	20	3
12	7	14	5	15	34	31	10	34	50	24	15	39	7	22	40	12	2	9	30	0
13	1	17	10	13	15	18	30	25	51	32	15	34	29	15	30	19	4	18	15	9
14	3	26	15	9	19	36	35	22	62	17	5	48	15	11	25	16	1	10	20	5
15	5	11	15	22	12	13	30	33	52	21	10	26	28	38	25	13	3	17	20	6
16	1	15	20	16	13	33	40	30	51	18	5	47	24	15	25	6	11	19	15	1
17	2	29	5	11	30	33	15	27	45	18	5	26	22	11	45	34	1	9	30	2
18	0	20	5	8	12	21	30	9	54	48	10	35	31	8	25	33	3	3	35	15
19	0	4	30	14	13	18	45	23	55	22	5	52	24	35	15	10	8	21	5	1
20	7	21	10	18	25	31	25	43	47	16	10	36	18	26	25	3	3	6	30	0

Legend: JP – Japan; RO – Romania; TN – Tunisia; TK – Turkey