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THE HAPPY PROJECT: AN ADAPTIVE EMOTIONAL SOCIO-TECHNICAL SYSTEM APPROACH

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Abstract: Gartner Inc.[1] forecasts that 8.4 billion connected things will be in use worldwide in 2017, up 31 % from 2016, and this will reach 20.4 billion by 2020. Such an important and effective growth indicates that systems must be more responsive to users' feedback on social networks. Unmanned technology will always remain incomplete for future studies. Therefore, socio-technical systems (STSs) will be introduced into our daily lives.

As well as filling the gap in the literature, this paper gives a brief description of an emotional adaptive STS, which is an original subject in matter of science and technology, and a new mining methodology. The emotional adaptive STS measures Turkish online happiness in software systems in order to give automatic feedback to the systems that try to minimize the time and effort of human beings. A wide variety of organizations may be interested in this research, which could be applied in many sectors.

Keywords: Well-being Informatics, Socio-technical Systems, Cybernetics Behaviural Analysis, Digital Addiction, Well-being Marketing, Big Data Analysis, Persuasive Technology, Gamification

[1] Gartner Inc.: *http://www.gartner.com/newsroom/id/3598917*

MUTLU PROJE: ADAPTİF DUYGUSAL BİR SOSYO-TEKNİK SİSTEM YAKLAŞIMI

Özet: Gartner, Inc.[2] raporuna göre 2016 yılında internete bağlı nesnelerin sayısı %31 artarak 8.4 milyar olmuş, 2020 yılında ise 20.4 milyar olması beklenmektedir. Böyle önemli ve etkili bir büyüme, sistemlerin kullanıcıların sosyal paylaşım ağları üzerindeki geri bildirimine daha duyarlı olması gerektiğini göstermektedir. Dolayısıyla insansız teknolojiler gelecekteki araştırmalar için daima eksik kalacaktır. Bu nedenle sosyo teknik sistemler (STSler) günlük yaşantımıza dahil olacaktır.

Bu araştırma literatürdeki boşluğu doldurmanın yanı sıra, bilim ve teknoloji alanında özgün bir konudur ve yeni bir madenleme metodolojisi içeren duygusal adaptif sosyo teknik sistem (STS) yaklaşımını da sunmaktadır. Duygusal adaptif STS, insan zamanını ve enerjisini minimize etmek için sistemlere otomatik geribildirim vererek Türkçe çevrimiçi gerçek zamanlı mutluluk ölçmektedir. Farklı organizasyonların ilgisini çekebilecek bu araştırma, birçok sektörde uygulanabilir.

Anahtar Kelimeler: Mutluluk Enformatiği, Sosyo-Teknik Sistemler, Sibernetik Davranış Bilimleri, Dijital Bağımlılık, Mutluluk Pazarlaması, Büyük Veri Analizi, İkna Teknolojisi, Oyunlaştırma

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[2] Gartner Inc.: *http://www.gartner.com/newsroom/id/3598917*

INTRODUCTION

Crowd platforms not only create new business areas based on the analysis of institutions and objects, but also improve the competitiveness and productivity of existing sectors through billions of online people valuable data on the Internet and mobile networks. Firms will thus be able to define their target groups and they can thenprepare better sales and marketing campaigns (Polat, 2014, p. 41). Nowadays many different sectoral institutions, including states, are taking innovative steps towards transforming large amounts of information into knowledge. In recent years, even ordinary things have become smart and user-system interaction can be extracted for instance from online smart watches, which map your mood by sensing your energy from your heart rate change in blood pressure, and determine your emotions from your heart rate variability. Imagine the watch can also measure and compare your happiness by analyzing text. Let's add the wisdom of the crowd (Surowiecki, 2005) to this watch. According to Surowiecki (2005), large groups of people are smarter than an elite few, no matter how brilliant, and are better at solving problems, fostering innovation, coming to wise decisions, even predicting the future. Thus, the smart phone becomes more than HCI (Human-Computer Interaction). Let's add game techniques and fun to the software. You play a game by answering funny visual questions. We can then collect data easily from system users at real-time. We can also easily measure social happiness about any subject. Knowledge obtained from social networks is extremely valuable because the millions of opinions expressed about a certain topic are highly unlikely to be biased (Mostafa, 2013, p.4241). Thus, we can understand the crowd's feelings in an STS and then it may be possible to control the system so as to change the users' behaviors. The system could then advise you above something according to your mood, or recommend something according to the crowd's mood.

It is now a well-known fact that a happy workforce brings great competitive advantage to businesses in the modern economy. Happy citizens bring a positive force to the economy. Even acting like an optimist is good for the economy (Kenny, 2015, pp. 20-21). As a result, happiness is a very important research topic in society, science and industry and it is one of the most important issues in life. Such an important concept, namely happiness, must be governed. How can we manage happiness if we can't measure it? Understanding social happiness gives us a competitive advantage through continuous market monitoring at real-time. If we measure happiness as a key tool for making a decision on social networks, we can also generate improving strategies related to the system in order to change the perceptions that drive the behaviors of users. If we understand the crowd's happiness, we can control it and we can then drive the crowd's behavior. Happiness will be manageable in social networks if we measure that emotional well-being in

an STS. We need to use an adaptive (Ali et al., 2012), dynamic approach to measure happiness on social networks.

Big data are important in business. Managers can measure, and hence know, radically more about their businesses, and directly translate that knowledge into improved decision making and performance. As the tools and philosophies of big data spread, they will change long-standing ideas about the value of experience, the nature of expertise, and the practice of management. Smart leaders across industries will see using big data for what it is: a management revolution. You can't manage what you don't measure (McAfee & Brynjolfsson, 2012, p. 72).

Conventional survey methods and other statistical methods used in measurement are based on people's reasoned experiences, prejudices and personal perceptions. In addition, they are not real-time methodologies. Their costs are high. All these methods are carried out with limited participants. In the experimental sampling method and day reconstruction techniques, which are used in happiness measurement, participants are likely to give inaccurate statements. Thus, the level of information accuracy can be low. Although neuromarketing and fMRI are gaining popularity, these techniques are based on personal memory and personal perception. Their costs are high. Methods which analyze online data such as text mining (TM), sentiment analysis, and opinion mining, measure only a few assumptions while truncating the data in a limited manner. In addition, there are online Turkish data studies in the literature which use automatic sentiment analysis programs based on the English translation dictionary. The results of these studies are limited by existing indices. To measure Turkish happiness on social networks, it is necessary to use a complementary methodology which is fast, transparent, based on online expressions, non-responsive, adaptable, crowd-sourced and measurable against people's self-assessment. It should be able to be integrated into things.

Every "thing" has an interaction with people or things. An unmanned technology will always be lacking. STSs are designed to facilitate human life in terms of the social dimension as well as the technical dimension. They are social systems operating on a technical base, e.g. blogs, Wikipedia, Facebook and YouTube. They include not only the human concept in technology but also the crowd. They integrate the power of the crowd with human-computer interaction. Therefore, they include psychology as well as social disciplines. HCI is then a person plus an IT (Information Technology) system, with physical, informational and psychological levels. Just as IT isn't hardware, so HCI isn't IT, but the child of IT and psychology. HCI links CS to psychology just as CS linked engineering to mathematics. HCI introduces human requirements to computing and HCI systems turn information into meaning. Finally, people can form an online community with hardware, software, personal and community levels. If the first two levels are technical and the last two social, the result is an STS. If technology design is computing built to hardware and software requirements, then socio-technical design is computing built to personal and community requirements. In STSs, the new "user"

of computing is the community (Whitworth & Ahmad, 2014). In order to design an STS, social and behavioral sciences are important as well as technical sciences. A community works through people using technology as people work through software using hardware, so social requirements are now part of computing design (Sanders & McCormick, 1993).

If we want to understand users in social networks, we should observe their cybernetic behaviors and their behavioral changes. In order to understand emotional behaviors, we must first measure emotions correctly. With the possibility of measuring happiness in social networks, the happiness of large masses of data can be measured at real-time for various purposes. For example, the average happiness of a strategy can easily be determined by the government. In addition, real-time analysis helps us achieve immediate and up-to-date results from large data sets. In this study we aim to generate an STS, which measures happiness from Turkish online data to minimize the time and the power of the designers and the users. We plan to develop a set of normative emotional ratings for the Turkish language in order to standardize materials for researchers in the field of emotion. We will present the distributions of psychological valences, which will show us the happy words. The happiness index must be designed for Turkish because of the differences in the meaning of happiness due to cultural variations; if not, the translated dictionary's valence values are not adequate to measure Turkish happiness correctly. This research also presents two STSs which will be generated for different purposes, but both STSs will use the emotional Turkish happiness index at real-time.

LITERATURE

It is hard to measure emotional feelings, especially if they are collected from social media (Stoica et al., 2013, Stoica et al., 2014), but, there are important sentiment analysis studies which measure online happiness (Mihalcea & Liu, 2006; Brew et al., 2011; Gruzd, Doiron & Mai, 2011; Garcia & Sikström, 2013; You, DesArmo & Joo, 2013; Wang et al., 2014). Sentiment analysis and opinion mining are fields of areas that are used to understand people's opinions, evaluations, attitudes, and emotions generally from written language. Sentiment analysis applications have spread to almost every possible domain, from consumer products, services, health care, and financial services to social events and political elections. Many big corporations have also built their own in-house capabilities, e.g., Microsoft, Google, Hewlett-Packard, SAP, and SAS. Such practical applications and industrial interests have provided strong motivations for research in sentiment analysis (Yuan, You & Lou, 2015, pp.32-33).

In general, normal people think that happiness is the most desired thing in life (Diener & Chan, 2011; Layard, 2007; Lyubomirsky, 2007). Although happiness is one of the most important issues in life, it is also one of the most difficult interdisciplinary fields. The subjects of happiness and well-being have been studied for a long time in psychology (Neugarten, 1961; Veenhoven, 1984; Veenhoven, 2012a; Veenhoven, 2012b). The subject of happiness has long been studied in

economics (Frey & Stutzer, 2001) and in behavioral economics (Kahneman et al., 2004). The Happy Planet Index[3] measures people's happiness in terms of long, happy lives. The countries are ordered according to their happiness. The Happy Planet Indexes of 151 countries are published in 2012. The Index combines four elements to show how efficiently the residents of different countries use environmental resources to lead long, happy lives. To measure wellbeing, researchers collect data via a globally renowned survey that asks participants questions about how they feel their lives are going overall. Jalloh et al. (2014) reviewed the literature on happiness relating to the common constructs used to define and explain the concept of happiness, including the most common scales and instruments utilized to measure this concept.

Many researchers measure happiness with survey questionnaires asking participants questions about their lives to understand how happy they are. Therefore, they measure happiness in a subjective sense. Some of the important scales in the literature are as follows: Single-Item Measurement of Happiness (Abdel-Khalek, 2004); Subjective Happiness Scale (Lyubomirsky & Lepper, 1999); Satisfaction with Life Scale (SWLS) (Diener et al., 1985); Oxford Happiness Questionnaire (Hills & Argyle, 2002); and Bhutan's Gross National Happiness Index (Ura et al., 2012). There are a limited number of participants in these methods, which are not designed for measuring the crowd's happiness.

Happiness is measured by asking people how happy they are. Two objective approaches are used: experience sampling (Csikszentmihalyi, 2005; Larson & Csikszentmihalyi, 2011) and day reconstruction (Kahneman et al., 2004). Even today, there are very easy-to-use accessories that detect body temperature and present the mood of the participants. In addition, there are studies on happiness, which use mobile phones with the experience sampling method (Holton, 2015). However, all these methods have many disadvantages. They are expensive. They are based on memory and personal perception. Participants can give incorrect answers. To measure happiness on social networks, it is necessary to use a complementary methodology, which can be used on crowd-sourcing platforms. Our research presents a new methodology to overcome these disadvantages.

Online happiness measuring systems were developed after 2010. The Affective Norms for English Words (ANEW) dictionary was developed to provide a set of normative emotional ratings for a large number of words in the English language, in order to provide standardized materials that are available to researchers in the study of emotion and attention (Bradley & Lang, 1999). There is also a research group[4] which mines the large-scale system-level data in the field of socio-technical mining systems (STMS). With hedonometer.org the group created an instrument that measures the happiness of large populations in real-time in ten

[3] Ayrıntılar için- http://www.happyplanetindex.org/about/#sthash.tOvY5VgD.dpuf
[4] Hedonometer- http://hedonometer.org/

languages. Dodds and Danforth (2010) quantified happiness levels on a continuous scale for a diverse set of large-scale texts: song titles and lyrics, weblogs, and State of Union addresses. Their method, which can be seen as a form of STMS, was based on large-scale texts to use human evaluations of the emotional content of individual words within a given text to generate an overall score for that text. They use the ANEW dictionary, and the labMT 1.0 dictionary, which was developed by using the crowdsourcing power of Amazon's Mechanical Turk. CyberEmotions[5], is a 7th FP EU consortium which began in February 2009 and ran for a period of four years. It aims to understand the process of collective emotions formation in e-communities with sentiment analysis studies. Kahya Ozyirmidokuz and Stoica (2016) calculated online product happiness by using the average emotional valence values of online customer opinions. They translated the ANEW dictionary into Turkish. The Turkish translation of ANEW has fuzzy cultural emotional statements. Because the current dictionaries are not designed for Turkish according to cultural social, linguistic differences, these studies will always have incomplete results. ANEW is not developed on social networks. In this research, we will develop a Turkish online happiness index. In addition, we will present two STSs, which are the digital detox therapy and the happy brand.

METHOD

The classical data mining approach is not sufficient to solve the online emotional problem. The main aim of the research is to generate an STS which measures happiness from Turkish online data to minimize the time and the power of the designers and the users. To achieve this, we will follow a qualitative approach. Thematic maps will be obtained and relations will be determined. Thematic analysis is a widely used method in qualitative research (Braun & Clarke, 2006; Guest et al. 2012). Gamification (DeBurr, 2013) techniques will be used while designing the STSs. In addition STSs include two persuasive technology (Fogg, 2003) techniques, which are self-monitoring and surveillance (Almaliki & Ali, 2007). In addition to generating the STSs, we will try to answer some more research questions about the case topics. What are the STS users' needs? What STS features should be used to measure happiness? How can we create a Turkish happiness index (dictionary)? How can we determine the performance of the STS? How can an STS's quality be improved at real-time? How can we improve the software quality of the STSs? We will generate a Turkish happiness index and then we will conduct 2 case studies by generating STSs. The case studies are happy brand and social detox therapist STSs. The happy brand is an STS which measures a brand's and the customers' happiness. In addition, it measures the crowd's happiness with a brand strategy. What is the level of happiness with a specific brand? What is the average happiness level of consumers? What is the level of happiness with a brand strategy? What are the consumers' requirements? How can the level of consumer happiness be increased to improve adaptive STS quality? Digital addiction (Alrobai et al., 2016) is an emergent

[5] http://www.cyberemotions.eu/index.html

research area and explores the problematic usage of digital media described as being obsessive, excessive, compulsive, impulsive and hasty6. The social detox therapist is a socio-technical adviser which warns social media users when their happiness declines. In this research, we also try to investigate the relations between happiness and social addiction. What are the relationships between the level of happiness of a user and social addiction, as well as the relationship between the digital addiction and the happiness? What is the average happiness level of dependent users? What are the differences between the personal and group levels of happiness of a social media user? What is the happiness synergy, which is created by a user on social media? What are the factors that reduce social happiness? In order to answer these questions we will generate two STSs. Figure 1 presents the structure of an STS. The real-time data are collected from social networks by web mining. After applying natural language processing and text mining, the happiness valence scores are calculated. STSs use Turkish happiness index.

Figure 1. The system, which measures online happiness

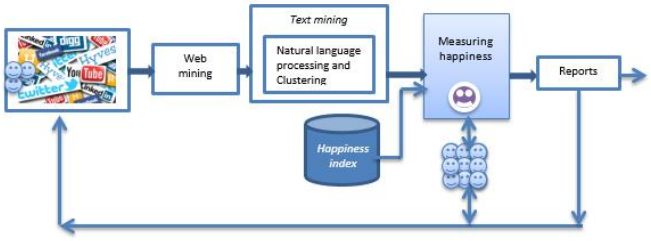
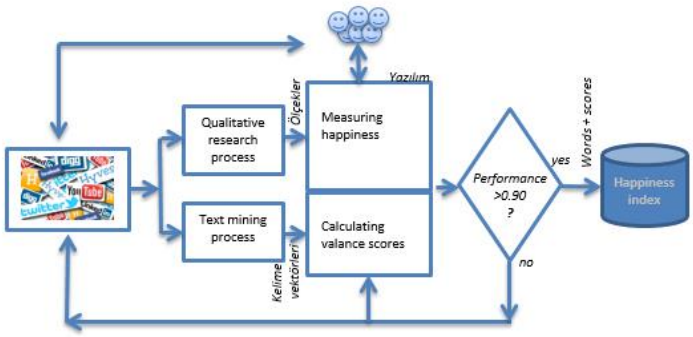


Figure 2 presents the formation of the happiness index. Data will be collected with daily studies, interviews, online and with surveys. We will collect data from social media, crowdsourcing platforms (news, Forums, Facebook[7], Twitter[8] etc.). Qualitative research techniques including thematic coding (Lichtman, 2013; Namey et al., 2007) and text mining techniques will be used simultaneously. In the text mining process, after collecting all the unstructured data from a forum website, the online data will be converted to documents. Tokenization will be applied to break up the streams of documents into tokens, which are meaningful elements. Then a Turkish stemming algorithm, which finds the stems of the words will be used. All tokens will be transformed into lower cases. We will also filter tokens by length,

[6] Bournemouth University Digital Addiction Research Group; https://research.bournemouth.ac.uk/project/dar/
[7] Facebook- http://www.facebook.com/
[8] Twitter- https://twitter.com/

removing all the words composed of less than 2 characters and with more than 20 characters from the documents. The unnecessary words and the html codes will be deleted. A vector space model was used to represent each document with the word vector, which is a numeric matrix. Similarity analysis and clustering techniques will also be applied. In the qualitative process, according to the resesarch questions, we will use thematic coding to find the themes, codes, and the categories of the data from STS feedback. We will achieve relations, namely thematic maps (Kahya Ozyirmidokuz, 2015). Then we will develop scales to measure the personal happiness levels and the group happiness levels. Consequently, we will form the word list and the survey questions, which will be used in measuring the valence scores of the words. The 500 online participants who will have an independent id code will respond to the surveys in the crowd-sourcing platform. We will thus form a wisdom crowd. We will measure the group happiness and the personal happiness level by questionnaire. Then we will obtain the valence scores of the Turkish words from the participants randomly while comparing the scores with the participant's happiness level and the group happiness level. While collecting data on social networks, we will use gamification techniques. Consequently, we will calculate the performance of the scores according to the group average happiness and if the performance is more than 90% we will then add the word and the score to the dictionary.

Figure 2. The process of developing Turkish happiness index



Measuring Happiness Index Level

From the perspective of human felt experiences rather than at the neurological levels, it seems that there are two fundamental dimensions rather than a collection of differing kinds of emotions. First, the valence of an experienced emotion is the degree to which it is strongly positive or negative. The second level is the level of arousal felt, that is the amount of energy perceived. A consequence of this is that identifying valence and arousal linked to a particular word is likely to be

far easier and more reliable than other types of emotion detection (Dhawan et al., 2014, p.1146). First, the valence of an experienced emotion is the degree to which it is strongly positive or negative. Second, the level of arousal felt is the amount of energy perceived (e.g., from lethargic to hyperactive). This assertion apparently contradicts the neurological evidence mentioned earlier of at least five emotions and the linguistic evidence in the form of the existence of a wide range of non-synonymous terms for emotions. Nevertheless, research has shown that people describing the same traumatic event may use a wide range of different emotional terms (e.g., sad, angry, upset) almost indiscriminately (Barret, 2006) and that the two dimensions of valence and arousal seem to be the key underlying factors. A consequence of this is that identifying valence and arousal is likely to be far easier and more reliable than identifying other types of emotion (Thelwall et al., 2011). To estimate the overall valence score for a text, which we denote by ν_{text}, we determine the frequency f_i that the ith word from the ANEW study word list has in the text; we then compute a weighted average of the valence of the ANEW study words as in Equation (1). The ν_i is the ANEW study's recorded average valence for word i (Dodds & Danforth, 2010). The distribution of psychological valence will show us the happy words. The average valence of a text is given in Equation (1) (Bradley & Lang, 1999).

$$\gamma_{text} = \frac{\sum_k \gamma_k - f_k}{\sum_k \mathrm{f}_k} \qquad \text{Equation (1).}$$

CONCLUSIONS

In recent years, the use of mobile network connections has increased dramatically. This increase forces people to interact with systems on networks regularly throughout their daily activities. As systems become smarter, the importance of humans or the crowd in these systems increases. The interactions of things with each other and with people are transformed into data. When things are connected with each other, it becomes important to transform these data into decisions and to apply them to the adaptive systems. Thus, there arises a necessity to use STS, which includes techcnology and the social dimension as well. In the near future, people will start to live with these systems while giving feedback at real-time. In this research, we present a new methodology to measure happiness. We plan to develop a set of normative emotional ratings for the Turkish language in order to standardize materials for researchers in the field of emotion. We will present the distributions of psychological valences, which will show us the happy words. The happiness index is required for Turkish because of the differences in the meaning of happiness due to cultural variations; if not, the translated dictionary's valence values are not adequate to measure Turkish happiness correctly. This research also presents two STSs which will be generated for different purposes, but both STSs will use the emotional Turkish happiness index at real-time. The brand happiness STS will

measure and manage the happiness of a brand. Consequently, a firm can easily generate improvement strategies by comparing the happiness scores to change the perceptions that drive customers' behaviors. Decision makers can also use the results of the STSs to make decisions. The digital detox therapy STS will help people to make decisions, which make them happy, and to manage their happiness and then to drive their behaviors.

Understanding the emotions, which are related with STS ensures system designers are constantly aware of the market and gain a competitive advantage in the rapidly changing world at real-time. Prejudices will be minimized in collective feedback from users who instantly share their experiences at real-time before forgetting them.

The subject and scope of this research are a new and important field. In addition to enriching the literature on emotional online analysis, it can also be used in critical areas. The STS integrates both technical and social features into a system; this includes everyday life systems, such as energy, disaster management, agricultural management, tourism information systems, food production and consumption, traffic management, economised software evaluation, economized resources, national security, etc. Consequently, this study may be applicable to many different sectors of vital importance to the economy and society. A wide variety of organizations may be interested in this research, which could be applied in many sectors, from advertising to politics.

An STS must capture the dynamism of life throughout the process to stay up-to-date and validate the software by the users' themselves. Meeting users' needs will postively contribute to Turkey's economic development by increasing performance and productivity in important sectors of the economy.

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