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Mobile Application Classification Method Using Machine Learning Based User Emotion Recognition

Taewon Kwak, Sungkyunkwan University, wonny2001@naver.com

Abstract: In this paper, we propose a convolutional neural network based application method which shows superior performance in image classification. Recently, various requirements such as emotional UI, rather than the existing Touch UI method, have been presented in the mobile UI field, and a methodology for this is presented. First, it recognizes human facial expressions through Convolutional Neural Networks (CNN).Based on the second recognized facial expression, a multi-layer perceptron (MLP) Learning. This enables the application to be executed only by the user's face when the mobile application is restarted. In order to implement and experiment on this, we implemented and experimented with the Google inception model structure to enhance the performance of face recognition in the first CNN - based facial recognition step. In the second application classification step, We implemented a method using multidimensional data for recognition. As a result, CNN - based facial expression recognition achieved about 98% accuracy, and based on this, the application classification to be studied in this paper was able to obtain a maximum of 97.9% accuracy

Keywords: CNN, MLP, Emotion Recognition, Facial Recognition, Mobile Application

Geometric Programming: A Strong Optimization Tool for Biological Systems

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Abstract: Geometric Programming: A Strong Optimization Tool for Biological Systems Sherry Swartwout1, Ehsan Atefi2, and Nand Jha3 1Undergraduate student, Mechanical Engineering, Manhattan College, sswartwout01@manhattan.edu. 2Assistant Professor, Mechanical Engineering, Manhattan College, ehsan.atefi@manhattan.edu. 3Professor, Mechanical Engineering, Manhattan College, nand.jha@manhattan.edu. We used Geometric Programing to develop a computational model of the human respiratory system for studying the influence of ambient air quality on cell metabolism. The respiratory system was modeled as a system having two inputs with two outputs consisting of three phases. Each phase has several components that are exchanged between air and blood in the human respiratory system including oxygen, carbon dioxide, hydroxyl group, ions, etc. This model has been discussed in detail by Beightler and Philips [1]. Next, Gibbs free energy was developed for the block model using thermodynamics of phases with multiple components. Finally, Geometric Programing was implemented to minimize the Gibbs free energy resulting in finding the phase-forming component concentration. Geometric Programing enabled us to precisely study the effect of change in ambient air quality on the levels of oxygen and other components delivered to the cells. The outcome of this study is used to analyze the effect of ambient air component on tissue metabolism. [1] C. S. Beightler and D. T. Phillips, "Applied Geometric Programming", John Wiley & Sons Inc; 1St Edition, 1976.

Keywords: Operation Research, Optimization, Geometric Programming, Sensitivity Analysis, Biological Systems, Human Respiratory System

A Simulation Approach for Estimating 112 Emergency Department Capacity Under Changing Population

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Abstract: 112 Emergency departments play an important role in the case of accidents and emergency health problems. The number of ambulances and the location of 112 service stations have vital importance on reaching to the emergency case as well as the time of arrival and departure of the ambulances from the stations. Effective planning of the capacities of 112 services in an appropriate manner facilitates the management of the process. Determining the capacity by using of real data based estimation methods will bring a more effective management process. The purpose of this study is to plan the capacity requirements of 112 Emergency Service Stations by estimating the growth of population in the European side of Istanbul. The population data of selected region was obtained by TURKSTAT (Turkish Statistical Institute) web site for 2008 to 2017. Some interviews ware done with 112 Emergency service directors and 10 years of call-time data was taken by providing necessary permissions and ethical statements. This call-data was transformed to inter arrival call time data. This data was tested by Kolmogorov-Smirnov conformity test to observe if it fits with exponential distribution through SPSS software. After following these steps, a regression model was created between the growth of population and inter arrival times of call-data. New inter arrival times were obtained and a simulation model was built to mimic the new behavior of 112 Emergency Service in the European side of Istanbul. By simulating the 10 years of data obtained from estimation, the 112 Emergency Service capacity requirement of selected region was forecasted.

Keywords: Discrete Event Simulation; Regression Modelling; Emergency Department Capacity Estimation; Capacity Planning

Androıd Applıcatıon "Gamarc" As Support To Green Campus Concept – Case Study Ugm Yogyakarta

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Abstract: University of Gadjah Mada (UGM) is the oldest university in Indonesia located in Yogyakarta city, precisely in Bulaksumur region. In the framework of educopolis area, a conducive environment for learning process and responsive to ecology issues, the provision of campus bicycle service as one of the manifestation of the vision is required. In the process of borrowing bicycles in the preceding system exist some problems with the manual paper recording system used by some campus bicycle lending stations. As a response to the ineffectiveness of the previous campus bike lending service process, an Android – based lending application which facilitates services is necessary, concerning the mobility and touchy traits of communication among academic community that is more fluent in using the smartphone nowadays. This application is made by waterfall method using Android Studio software. Users of this application are Students, campus bike administrator, Lecturer and the internal employees of UGM (Civitas academica UGM). This research produced an UGM campus bicycle lending application called GamaRC. This application can facilitate users to make the process of borrowing and refunding the campus bike with barcode scanning facility. GamaRC application is expected to be implemented in the internal environment of UGM campus so that the concept of educopolis and green campus UGM can be fulfilled.

Keywords: Green Campus; Campus Bike Applications; Lending System; SDLC Waterfall Method

Mechanical milling as green technology to produce novel bio-based polymer nanocomposites

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Abstract: The introduction of novel functionalities into polymers, by means of mechanical milling, is one the greatest challenges of science and technology of materials. Mechanical milling has been demonstrated to be an efficient and green technique for the production of polymeric nanocomposites with advanced structural and functional properties. The possibility to avoid solvents and high temperatures contains within itself several advantages. Solvents generate inevitable disposal and environmental problems; high temperatures and shear stresses cause degradation in polymers. The main advantages, in comparison with the traditional technologies, are the simplification of the processes, ecological safety and decrease in number of technological stages. Mechanical milling is a green and cost-effective method that involves the use of mechanical energy to produce novel materials. Very recently it has been used as revolutionizing technique for the manufacture of many advanced polymeric nanocomposite. The methodology to incorporate fillers into the polymeric materials are those currently used, such as casting from solution and melt blending at high temperatures. Mechanical milling at low temperature and with no solvents has been demonstrated to be not only the most suitable for natural polymers that undergo degradation phenomena before melting, but also useful for the incorporation of nano-fillers with labile (active) molecules. In this work are presented several examples of novel bio-based nanocomposites having multifunctional properties obtained using this green technology. The development of this alternative technology for produce polymer nanocomposites allow the possibility: 1) to produce advanced materials at ambient temperature, 2) to modify polymer structure and physical properties without chemical reactions, 3) to introduce thermo-labile molecules into nano-structures, 4) to process thermosensitive polymers and nano-fillers

Keywords: Mechanical Milling, Green Technology, Polymer Nanocomposites

Wearable Technology for water dispersal of Clear surfaces

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Abstract: This research project aims to investigate the design and development of an electronic, wearable anti-water device to address the problem of reduced visibility, on clear plastic and glass surfaces, caused by collected surface water. The research integrates a number of disciplines including electronic engineering, IOT and wearable technology. Central to the project is the use of the principals of centrifugal and centripetal forces and it includes the development of custom electrical and engineered prototype components as well as 3D printed housing units. It is hoped that the proposed device will offer a practical and permanent solution to a major safety concern across a range of industry sectors. Crucially it also provides an alternative environmentally friendly solution that avoids use of damaging chemicals. Preliminary research has shown significant commercial potential for the development of such new wearable technologies. For example, the motorcycling industry generated a gross output of approximately $7.3 billion in 2016, yet there are currently no technology solutions (helmet, visor or goggles) on the market to provide a reliable, safe and robust water dispersal options. There are also a range of other industry sectors with significant cross-over potential as many other areas are impacted by reduced visibility on clear surfaces. Eg. Camera technology. Drone technology, Emergency Services, Sport & Recreation and Military.

Keywords: Internet of Things Wearable Technology Electronic Engineering

New Eclat Algorıthm Based on Map Reduce Framework

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Abstract: The data mining is an approach that is used to draw the relations, correlations, patterns from the data that exists in the data repository. Association rule mining is one of the data mining techniques that are used for mining/ extraction of items/ trends from the set of data. Mainly association rule mining is used for mining frequent itemsets that leads to generation of associations among the data set. The proposed work is to develop an Eclat algorithm with Map Reduce framework to carry out the extraction process effectively. The Algorithm is implemented in four phases that are Data Extraction, Partition into groups, Map reduce technique and Redistribution process. The transactional data from FIMI repository is collected. The data file contains list of transactions that is transaction Ids with corresponding set of items. During data extraction phase the tids and itemsets are separated out for further processing. The items are then partitioned into groups by using k-means clustering based upon the centroid values. Third map reduce technique is applied, in which data items are mapped with each other than shuffled and reduced to eliminate same set of data. In end redistribution is carried out, with the split and merge process on the basis of the minimum support count that is computed and items are categorized into frequent and infrequent itemsets. The factor on with the performance of the proposed algorithm is computed are computational speed and processing time.

Keywords: Data Mining, Eclat, Map Reduce

The application of long range ultrasonic testing (LRUT) for examination of Crack, Wear, Fatigue Stress and Corrosion on Turbine Shaft.

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Abstract: LRUT (Long range ultrasonic testing) is a rapid way of screening for corrosion in pipelines in oil, gas and petrochemical industries. LRUT is performed using a system which is made up of a low frequency flaw detector, a pulsar receiver unit, some transducer rings, and a laptop computer which contains the software that controls the system. The technique differs from conventional ultrasonic testing, in this method, when generated in pipes these plate waves are known as guided waves. This method of NDT is available for difficult or impossible condition of test (e.g. where the pipe is buried, insulated, sleeved elevated on pipe racks, etc. LRUT provides information about the presence of flaws and their location along the pipe. This paper presents the methodology of using LRUT on Turbine Shafts, LRUT have many significant capability that by that capability we can inspect the considerable and sensitive shafts like turbine shaft, for example LRUT can test up to 100 meters screening distance on pipelines, the we can most of shafts by different long around 100 meters. LRUT can Focusing capability to evaluate corrosion distribution around pipe circumference, by this ability we can inspect and find damage, corrosion distribution and crack on around surface of shaft. LRUT have ability to Testing of pipe from 2" up to 48" diameter then LRUT have ability to testing of shaft in different diameters. And one of special and unique capability of LRUT is possibility to do test shaft with don't need to Disassemble of turbine. Also LRUT can detection of metal loss > 3%, this ability of LRUT is very useful to find detection on shaft surface. And finally LRUT can more than 100 times faster than traditional ultrasonic methods and Low cost screening with 100% coverage and available to test inaccessible sections. Keywords: LRUT, Shaft, Turbine, Pipeline, Damage.

Keywords: LRUT, Shaft, Turbine, Pipeline, Damage.

Using an Expert System to Optimize Energy Conservation in the Newark Public Schools

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Abstract: Energy auditing is widely used in existing facilities in order to determine how energy is used and how it can be conserved. In the design of new buildings, there are numerous tools to reduce energy usage through certifications systems like LEED and programs like ENERGY STAR® Portfolio Manager. It is often difficult, however, to make realistic prediction of improvement levels in existing buildings and to achieve desired results. The research team at the New Jersey Institute of Technology has developed an expert system using the science of heuristics to better model usage in existing commercial buildings and to predict future improvements more accurately. The software performs an initial audit analysis of all the major building systems including building envelope, HVAC, lighting, office equipment and appliances, water and hot water, and waste handling. A novel feature of the expert system is that it analyzes energy flow within the building more interactively and cohesively, as opposed to looking at each system individually as do most energy analysis tools on the current market. During the auditing process, the software queries user habits and system controls to understand occupant behavior, which can have a significant effect on actual energy usage. Responses are analyzed using Bayesian functions to develop heuristic factors, which are then applied to the results of the audit analysis. This ensures that energy usage is modeled as it is used and operated, as opposed to how it was designed, which can differ significantly. Once the heuristic factors are applied to audit results, the expert system performs a synchronization step with a forcing function to converge the calculated energy usage with actual consumption from the utility bills, so that energy efficiency may be optimized in the target building. The software then generates a list of recommended upgrades that are prioritized by cost, ease of implementation, and projected energy savings. Sustainable and resilient strategies are also recommended by the system, since it is becoming increasingly important that a building not only be “green” but also be resilient in the face of a disaster, natural or otherwise. It also identifies and directs the education and training that needs to be applied. The expert system has been calibrated and validated at ten school buildings within the Newark Public Schools District. These provide ideal test cases given the range of age, construction type, and extremes of heating and cooling loads associated with the Northeast climate.

Keywords: Green Technologies; Performance Management; Managing Sustainability; Energy Management; Energy Auditing;

Optimized Least Squares Support Vector Regression for Time-Series Prediction of Construction Stock Price

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Abstract: Stock prices are predicted to determine the future value of companies' stock or other financial instruments that are marketed on financial exchanges. However, the stock market is characterized by nonlinearities, discontinuities, and high-frequency multi-polynomial components because it interacts with many factors such as political events, general economic conditions, and traders' expectations. Therefore, making precise predictions of stock values are challenging. Recent research suggests that hybrid forecasting models can be usefully applied to the stock market's fluctuations, yielding satisfactory forecasting precision. This study used a sliding-window least squares support vector regression model to capture the linear and non-linear characteristics of a stock price time series and confirmed that hybrid forecasting models are powerful tools for practitioners in management science. To evaluate the proposed approach, it was applied to construction stocks in Taiwan. Historical daily closing stock prices were taken Yahoo! Finance, a publicly accessible website. The performance measures that were used to assess the predictive accuracy of the proposed system included the root mean square error (RMSE), the mean absolute error (MAE), the mean absolute percentage error (MAPE), and the mean square error (MSE). These indexes are used to measure whether the predicted values are close to the actual values. For the day-ahead prediction of construction stocks, the average RMSE, MAE, MAPE and MSE values were in the ranges of 1.372-2.308, 0.558-0.863, 1.372-1.745% and 1.883-5.239, respectively. In particular, the one day-ahead prediction of the price of the 2597.TW stock was better than those of the other construction companies in this investigation. Therefore, the proposed model can be used as a tool to forecast stock prices for short-term investing. The proposed model is a promising predictive technique for highly non-linear time series, whose patterns are difficult to capture by traditional models. It may be of great interest to home brokers who do not possess sufficient knowledge to invest in such companies. In the future works, the model can be verified by other stock markets such as China, Japan and Hong Kong.

Keywords: Least Squares Support Vector Regression, Metaheuristic Optimization, Hybrid Model, Construction Company, Stock Price Prediction.

Factor Analysis in Fault Diagnostics using Random Forest

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Abstract: Factor analysis is generally used in regression and classification problems for identifying the significance of each factor that contributes to the formation of class variable. This type of analysis is extensively used in application such as customer segmentation, data mining and predictive maintenance. Predictive maintenance or condition-based monitoring is a machine maintenance methodology where the health of the critical components of the machine is continuously monitored. The main modules of predictive maintenance are data collection, feature analysis, early fault detection, fault diagnosis, severity analysis, time to failure prediction and factor analysis. Factor analysis plays a trivial role in predictive maintenance to identify significant factors that contribute to the formation of each failure mode in the machine. This information is perceived as a feedback mechanism in the life cycle of a product. Key factors contributing to each failure mode is generally used to redesign the product to eliminate the potential failures. In this paper, an industrial rotating machine is used where vibration and ambient temperature data is collected for monitoring the health of the machine in real time. The optimal number of groups are identified by using within sum-of-square method and elbow method. Gaussian mixture model-based clustering is used to cluster the data into significant groups, and frequency spectrum analysis is performed to diagnose each cluster to a specific failure mode of the machine. The significant features that attribute to a particular mode of the machine are identified by using random forest classification model and variable importance analysis.

Keywords: Predictive Maintenance, Fault Diagnosis, Clustering, Factor Analysis, Random Forest

Investigating biopolymers enhanced with NFC for 3D printing

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Abstract: 3D printing is a relatively new manufacturing process by which parts are manufactured from a computer model in layers by selectively adding and consolidating the raw material in successive layers. Currently, the polymer based additive manufacturing industry mainly uses petroleum based filaments a limited and nonrenewable resource, and dominate the marketplace for traditional manufacturing methods such as injection molding. Recently, biopolymers that are more sustainable, such as polylactic acid (PLA), have started to gain traction as a competitor to these traditional synthetic polymers. These biopolymers, which are derived from renewable sources, can help reduce the dependence on petroleum based polymers which are generally considered non-renewable. The objective of this research is to investigate the use of polylactic acid enhanced with nano-fibrillated cellulose for 3D printing

Keywords: Biopolymers, Nano-Fibrilated Cellulose, 3D Printing

Correlation Analysis of Industrial Robotic Trajectory for Consistency and Motion Rate

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Abstract: This research is devoted to develop an empirical correlation mathematical based for consistency and time of a robotized industrial task simulating an automated manufacturing work-cell such as the robotic leaser cutting using an educational robotics test-cell. The correlation is to investigate contributions of the impact parameters on the performance of robotized work-cell. Processing time models the cycle time and quality of the task has been modeled in terms the consistency of cutline. A set of mathematical formulas have been used to simulate the consistency and cycle time in order to tackle the variability of proposed sources as pieces of time and dimensions that need to be processed in the loaded parts the work-cell; in addition the relationship that suggestively correlates the impacts. A set of experimental tests has been conducted responding to the predicted formulas for the cycle time and consistency. Experimentation factors that have been leveled from minimal to maximal values are selected based on the robot's computer operating system in terms of processing speed, motion properties, and termination types the default characters of the programming. Analysis the results shows that the correlation can be used to tradeoff the programming solutions objectively depending on the task design requirements. The contribution of this research work is to introduce a new depiction of optimizable factors of robotic computer programs that directly affect the performance criteria

Keywords: Industrial Robots, Manufacturing, Factors, Responses, DOE Analysis

Civil Engineering Education in Iran: From Curriculum Issues to Educational Policies

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Abstract. This study tries to provide a general overview of civil engineering education in Iran and specifically to present some of the major curriculum issues as well as misleading policies. To this end, a review of the available literature was conducted. Also, some public data, including policies and curriculum of civil engineering at the level of university were analyzed. From the curriculum perspective, the results of the study revealed that there are two main issues resulting in the failure of many civil engineering programs to train young engineers. First, the curriculum has not been updated for many decades so it does not reflect the new state-of-the-art technologies and advancement in the field of civil engineering. Second, the curriculum is theory based and lacks practical training for the students. By the same token, the policies in Iran toward education in general and engineering in particular are based on an overemphasis on localization which can deprive faculties and students from having enough collaborations with their counterparts in other countries. Therefore, by providing some suggestions, the researchers argue that in order to improve the quality of civil engineering programs in Iran, both the curriculum as well as the policies need to be revised to reflect the current needs of the students in the 21st century.

Keywords: Civil Engineering, Curriculum, Educational Policy

Relating Individual Characteristics and Task Complexity to Performance Effectiveness in Collaborative Problem Solving

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Abstract: The number of crews, teams, and collaborative systems within organization is expanding significantly. As the complexity of the environment in which employees operate increased, turning to team-based structures is increased. Some examples of the complex environments can be foreseeing the organization 10 years forward, team coordinating to save a life in an emergency room, or fighting with an ever-changing enemy in an ever-changing battle field. Regrading to increase in use of team, research studies are more interested in the prediction of effective team performance and factors that may have impact on performance. Team composition has been a popular topic because of its theoretical and practical implications. Theoretically, team composition research goes to the heart of understanding how individual attributes combine to form effective interdependent groups. Since about couple of decades ago, the team composition has been assumed to influence team processes and outputs. It has also been recognized as a crucial factor that impacts team performance. Yet, despite recognition of the importance of team composition variables, the effect of non-demographic composition characteristics on team processes and performance in work settings has seldom been studied. As one of the team-based skills, the term collaborative problem solving (CPS) is being developed more and more in a different variety of group task environments (e.g. face-to-face and with peers) specifically for novel and non-routine tasks. Several research studies and reports over the past two decades indicates the importance of CPS. The main purpose of this research is to evaluate how individual characteristics (e.g., personality and ability) of functioning work teams relate to differences in team performance effectiveness. This research includes evaluations of factors such as the task characteristics and personal characteristics on distributed collaboration groups engaged in problem solving tasks. Significant interactions might be found to indicate that there are combinations of traits more (or less) productive than expected, giving evidence that group composition affects group performance. Applying this alternative conceptual approach in the present experiment, it may be hypothesized that some combinations of individual traits would yield group performance

effectiveness differ. Characteristics such as interpersonal dependency, individual working memory capacity, or preferred learning style might contribute significantly to the variation in group performance effectiveness. Likewise, environmental factors such as task complexity may impact team performance. The research questions for this study examine whether participant performance on a demonstrable problem-solving activity would be affected by: (a) Team composition, and (b) complexity (simple task versus complex task).

Keywords: Collaboration, Decision making, Personality

Effectiveness of Business Accelerator Services in Turkey: From the Perspective of Startups

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Abstract

This study analyses the startup companies attending business accelerator programs in Turkey. Business accelerators are new generations of incubation programs born especially to support technology entrepreneurs and help them reach to the next level. This study makes a research on eight accelerator programs. These accelerators are Kworks, ITU Seed, SuCool, IOT Telco Labs, Pilot, Starter's Hub, Lonca and Albaraka Garaj. Using a survey developed for entrepreneurs attending these accelerator programs, this study provides an inside look into the effectiveness of these programs from the perspective of startup companies. The main goal of the study is analyzing how startups use the services provided by the accelerator program. A total of 125 entrepreneurs who belong to 106 different startup companies attended the survey. According to startup's employee size, average monthly turnover and exportation status, several hypotheses have been identified for measuring the effectiveness of supports provided in these accelerator programs. The data have been analyzed via SPSS and the hypotheses have been tested using Mann-Whitney and Kruskal-Wallis methods. There are studies studying entrepreneurs and companies in government incubators in Turkey but the literature lacks information about entrepreneurs and startups attending accelerator programs in Turkey. Therefore, this study contributes to the literature by filling this gap.

Keywords: Accelerators, Incubators, Startups, Digital Entrepreneurship

1. Introduction

Technology has developed rapidly for the past decade. Due to this advancement, anyone can easily start an internet business (Clarysse et al., 2015). The costs of founding a new technology business is much less now compared to the initial development phase of the internet. Open source software and cloud technology has reduced the costs of developing a new software significantly. Therefore, entrepreneurs need less capital and also, take less risk compared to the Nineties. In the Nineties, the costs of founding a new internet company was higher and required a serious investment (Hochberg, 2015). For that reason, starting a new technology business involved more risk (Dee et

al., 2011). In order to reduce this risk and support new ventures, business incubators started to be established around the world.

Incubators became widespread in the late 1980s as providers of office space and innovative companies gathered together in these centers (Adkins, 2002; Lalkaka and Bishop, 1996). Nevertheless, incubators didn't have an exit policy and this has led to problems for investors (Bruneel et al., 2012). As a result, a new type of program called "accelerator" was born. Accelerators, as the name suggests, accelerate new businesses by offering them specific services for a restricted amount of time usually from three to six months (Cubukcu and Gulsecen, 2018). These services include training, mentoring, office space, advertising, networking and access to different financing options (Cohen and Hochberg, 2014; Ozkasikci, 2013; Miller and Bound, 2011; Marangoz, 2016; Mian, et al., 2016). Technology companies called startups often apply to accelerator programs through an online open application system and they are accepted into the program after a certain selection process.

Miller and Bound (2011) states that an accelerator is defined to have the succeeding six characteristics: seed investment in exchange for equity, time limited support, an application process open to all, cohorts or classes of startups, a focus on small teams rather than individuals and graduation with a demo day (Clarysse, et al., 2015; Pauwels, et al., 2015). In Turkey, there are 28 accelerator programs as of April 2018 and only 10 of them carry these characteristics. Out of these 10 programs, 8 of them agreed to participate in the study and this study performs a research on the startup companies of entrepreneurs who have attended or are currently attending these eight accelerator programs. These programs are ITU Seed, Pilot, SuCool, Kworks, Starter's Hub, IOT Telco Labs, Albaraka Garaj and Lonca.

2. Startup Companies in Accelerator Programs

There are over 213 accelerators in the world according to Seed-DB, a platform that analyses accelerators (Pauwels, et al., 2015). There are only 28 programs that call themselves an accelerator in Turkey. However, there are very few studies in Turkey that analyses these accelerator programs. There are some studies that analyses the characteristics and demographics of entrepreneurs in government incubator centers such as Sungur and Dulupcu's "Survival Performance of Tenant Firms in Business Incubators (ISGEMS) in Turkey" (2013) and "The Role and Importance of KOSGEB in Improving the Entrepreneurship in Turkey" by Oktem, et al. (2007). Nevertheless,

many accelerators have been founded very recently usually within the past five years. For this reason, studies with entrepreneurs and their startups are not sufficient.

This study aims to look at statistics about startups in the 8 accelerator programs mentioned above. The need for support from accelerator programs and the benefits startups receive from these programs will be evaluated. Moreover, the below propositions will be analyzed.

Newly established companies must reach a minimum effective size in order to survive and earn revenues. (Wagner, 1994; Audretsch, 1995; Delmar ve Wennberg, 2010). Therefore, larger startup companies grow much faster and more in size compared to small ones. (Fritsch et al., 2006) Smaller companies also need more support to grow and progress and this support is achieved through accelerator programs.

H1a: As the business grows, the need for support from the accelerator program reduces.

H1b: As the business grows, the benefit it receives from the supports of accelerator program reduces.

H1c: As the financial turnover increases, the need for support from the accelerator program reduces.

H1d: As the financial turnover increases, the benefit the business receives from the supports of accelerator program reduces.

Startup companies in accelerator programs are in the growth and development phase and for this reason, they usually only do business locally. Since exporting is a complete different process in itself, startup companies often need consulting support to manage this process in the best possible way (Engelman et al., 2015). Startup companies prepare for exportation with the help of services provided by the accelerator programs and the incubator centers. (Engelman et al., 2015). It is obvious that exporting increase the volume of a company. There are studies explaining that exportation have a positive effect on the growth and survival of companies. These studies are described in Sapienza et al. (2006) and by Olivares and Suarez (2007). As the company grows, the need for accelerator programs decreases and the company benefits less from these supports.

H2a: Exporting reduces the need for support from the accelerator program.

H2b: Exporting reduces the benefit the business receives from the supports of accelerator program.

The fact that there is a lot of competition in the industry requires companies to make different breakthroughs in order to take a share from the market and grow. If there is a lot of competition in an industry, companies can get a share of the market by reducing prices, selling a very high quality

product or by offering an innovative product (Schmalensee, 1982, Gans and Stern, 2003). Startup companies often enter the market with an innovative product, but of course the product-price equilibrium must be in a position that the market can accept (Gans and Stern, 2003). Startups need accelerator programs to find out these rates and to prove themselves to the customers.

H3a: If there is not a lot of competition in the market, the need for support from the accelerator program reduces.

H3b: If there is not a lot of competition in the market, the benefit the business receives from the supports of accelerator program reduces.

3. Methods

The data for this study are provided by a survey on accelerator programs. The data collection process of the survey started at the end of September 2017 and completed at the end of December 2017. The methods used to collect data are as follows. First of all, the coordinators of the accelerator programs were called to get an appointment to visit the offices of the programs or their training facilities. Entrepreneurs who were present during the visit were requested to complete the survey at that point in time. The printed version of the survey was used in this phase for collecting data from entrepreneurs. The accelerators visited were ITU Seed, Starter's Hub, SuCool, Kworks, Albaraka Garaj and Lonca. The survey data filled in these programs were transferred to the electronic environment afterwards.

In electronic environment, SurveyMonkey is used to collect and save data. Coordinators of accelerator programs sent the link of the survey to the remaining entrepreneurs who were not present during the visit and also graduated from the programs. The training sessions of IOT Telco Labs and Pilot programs were over so these accelerators were not visited. For this reason, the data for these programs were only collected on the internet via the link sent to the entrepreneurs. Also, the link of the survey was shared in social media through groups of related accelerator programs and through various groups related to entrepreneurship. Thus, more data for the survey were collected.

A total of 162 people participated in the survey, but only 130 of them completed the survey totally. Amongst these 130 people, 5 of them were excluded from the study because they had participated in programs outside of the targeted accelerators, so overall 125 people in our target group filled out the survey. These 125 entrepreneurs belong to 106 different startups. This number is sufficient to move forward with the research considering other studies in the field. Mian (1997) interviewed

87 companies from 1 incubation center while doing a research on incubation centers. Rice (2002) conducted interviews with 32 entrepreneurs who are from different incubators along with 8 incubator coordinators. Ratinho (2011) interviewed 101 companies from 12 different incubation centers for his thesis. Meru and Struwig (2011) collected data from 124 different companies involved in any incubation center. Soetanto and Jack (2013) interviewed 62 entrepreneurs selected from 1 incubation center for their studies. Ebbers (2013) interviewed 101 entrepreneurs from 4 incubators in his study. For his thesis, Jorgensen (2014) worked with 150 entrepreneurs who are in the largest incubator center called Growth Factory in Denmark. Finally, Hallen et al. (2016) interviewed 70 entrepreneurs in 8 accelerator programs.

4. Results

Below you can find the tests of the hypotheses and their results. Descriptive statistical methods (mean, standard deviation, median, first quadrant, third quadrant, frequency, percentage, minimum, maximum) are used when the study data are getting evaluated. Normal distributions of quantitative data are tested with the Shapiro-Wilk test in addition to graphical tests. Mann-Whitney U test is used to compare the two groups of quantitative variables which are not normally distributed. The Kruskal-Wallis test is used to compare more than two groups of quantitative variables which are not normally distributed. If the Kruskal-Wallis test result is significant, then, Dunn-Bonferroni test is used to determine the groups that produced significance.

The hypothesis H1a is tested in Table 4.1. Supports that have a meaningful difference according to the comparison of support utilization levels by the number of employees in the company are given below.

Table Hata! Belgede belirtilen stilde metne rastlanmadı.**.1:** Comparison of support utilization levels by the number of employees employed in the company.

	Number of Employees				$\chi 2$	p
	0	1-3	4-5	6-20		
Training	4 (3, 5)	4 (3, 5)	4.5 (4, 5)	4 (3, 5)	0.746	0.862
Mentorship	4 (3, 5)	4 (4, 5)	4 (3, 5)	5 (4, 5)	1.515	0.679
Office	4 (3.5, 5)	4 (3, 5)	4 (3, 5)	4 (3, 5)	0.234	0.972
Laboratory	0 (0, 1)	1 (0, 2)	0 (0, 1)	1 (1, 3)	5.693	0.128
Advertising	2 (1, 3)	3 (2, 3)	2 (1, 4)	3 (3, 5)	7.991	0.046*
Networking	4 (3, 4.5)	4 (3, 4)	3.5 (3, 4)	5 (4, 5)	9.318	0.025*

Investment/Finance	3 (1, 4)	3 (2, 4)	2.5 (1, 4)	4 (2, 5)	3.293	0.349
Meeting with Investors	3.5 (2.5, 4)	4 (3, 4)	3.5 (2, 5)	4 (2, 5)	1.125	0.771
Going Abroad	1 (0, 3)	1 (0, 3)	1.5 (0, 3)	2 (1, 3)	1.511	0.680
Trademark registration / Patent application / Legal Counseling	2 (0, 3)	2 (1, 3)	2.5 (1, 5)	2 (1, 4)	2.043	0.564
Collaborating with organizations that support the accelerator	3 (2, 4)	3 (2, 4)	3 (1, 4)	4 (2, 5)	1.178	0.758
Technical Support	2 (1, 3.5)	2 (1, 4)	1 (0, 3)	2 (1, 4)	2.374	0.498

Kruskal Wallis test, median (Q1: first quarter, Q3: third quarter).
*$p<0.05$

According to the number of employees employed in the company, there is not a statistically significant difference in terms of the utilization of training, mentoring, office, laboratory, investment / finance, meeting with investors, going abroad, trademark registration / patent application / legal counseling services, technical support and cooperation with the supporting organizations ($p>0.05$). Significant differences are found in using advertising and networking services.

According to the number of employees employed in the company, statistically significant difference is found in terms of the utilization level of advertising services (p: 0.046). As a result of the evaluations made, it is found out that the utilization level of the companies which employs between 6 and 20 employees is higher than the ones with 0 employees (p: 0.041).

According to the number of employees employed in the company, another statistically significant difference is found in terms of utilization levels of networking services (p: 0.025). As a result of these evaluations, it is found out that the utilization level of the companies which employs between 6 and 20 employees is higher than the ones which employs between 1-3 and 4-5 employees (p: 0.037, p: 0.049, respectively).

In Table 4.2, the hypothesis H1c is tested. There is no statistically significant difference between the monthly financial turnover of the companies and the support utilization levels.

Table Hata! Belgede belirtilen stilde metne rastlanmadı..**2:** Comparisons of support utilization levels according to the company's monthly average financial turnover.

	Monthly Turnover					χ^2	p
	No sales yet.	100-5000 TRY	5000-10000 TRY	10000-20000 TRY	≥ 20000 TRY		
Training	4 (3, 5)	4 (4, 4)	4 (3, 5)	4 (3, 5)	5 (4, 5)	2.830	0.587
Mentorship	4 (4, 5)	4 (3, 5)	5 (4, 5)	4 (3, 5)	5 (4, 5)	7.421	0.115
Office	4 (3, 5)	4 (3, 5)	4.5 (3, 5)	4.5 (3.5, 5)	4 (3, 5)	1.010	0.908
Laboratory	1 (0, 2)	0 (0, 1)	1 (0, 1)	1 (0, 3.5)	0 (0, 2)	1.302	0.861
Advertising	2.5 (1, 3)	2 (2, 4)	3 (1, 4)	2 (1, 3)	3 (2, 5)	1.331	0.856
Networking	4 (3, 4)	4 (3, 5)	4 (3, 5)	4 (2.5, 4)	4 (3, 5)	4.989	0.288
Investment/Finance	3 (2, 4)	3 (3, 4)	2.5 (1, 4)	2.5 (1, 3.5)	3 (3, 4)	3.772	0.438
Meeting with Investors	3 (2, 4)	4 (3, 4)	4 (3, 5)	3 (1.5, 4)	4 (4, 4)	9.432	0.051
Going Abroad	1 (0, 3)	1 (0, 3)	1.5 (1, 3)	1.5 (0, 3)	1 (0, 5)	0.680	0.954
Trademark registration / Patent application / Legal Counseling	2 (0, 3)	1 (0, 3)	2 (1, 3)	2.5 (1, 3.5)	3 (2, 5)	7.120	0.130
Collaborating with organizations that support the accelerator	3 (2, 4)	4 (3, 4)	3 (2, 4)	3 (1.5, 3)	4 (2, 4)	4.198	0.380
Technical Support	2 (1, 4)	2 (1, 4)	2 (1, 3)	2 (1, 3.5)	3 (1, 4)	0.939	0.919

Kruskal Wallis test, median (Q1: first quarter, Q3: third quarter).

According to the monthly financial turnover of the company, there is not a statistically significant difference in terms of the utilization of training, mentoring, office, laboratory, advertisement, networking, investment / finance, meeting with investors, going abroad, trademark registration / patent application / legal counseling services, technical support and cooperation with the supporting organizations ($p>0.05$).

The hypothesis H2a is tested in Table 4.3. The following are the supports that have a significant difference according to the comparison of support utilization levels by the exportation status of the company.

Table Hata! Belgede belirtilen stilde metne rastlanmadı..**3:** Comparison of the utilization level of services by the company's exportation status.

	Exportation		z	p
	Doesn't Export	Does Export		
Training	4 (3, 5)	5 (3, 5)	-1.231	0.218
Mentorship	4 (4, 5)	5 (4, 5)	-1.080	0.280
Office	4 (4, 5)	3 (2, 4)	-2.572	0.010*
Laboratory	1 (0, 2)	0 (0, 1)	-1.353	0.176
Advertising	3 (1, 3)	2 (2, 3)	-0.271	0.786
Networking	4 (3, 4)	4 (3, 5)	-1.282	0.200
Investment/Finance	3 (2, 4)	3 (2, 4)	-0.302	0.763
Meeting with Investors	4 (2, 4)	4 (4, 5)	-1.918	0.055
Going Abroad	1 (0, 3)	2 (1, 4)	-0.922	0.357
Trademark registration / Patent application / Legal Counseling	2 (1, 3)	2 (1, 2)	-0.790	0.429
Collaborating with organizations that support the accelerator	3 (2, 4)	3 (1, 4)	-0.806	0.420
Technical Support	2 (1, 4)	2 (1, 3)	-0.389	0.698

Kruskal Wallis test, median (Q1: first quarter, Q3: third quarter).
*p<0.05

According to the exportation status of the company, there is not a statistically significant difference in terms of the utilization of training, mentoring, laboratory, advertising, networking, investment / finance, meeting with investors, going abroad, trademark registration / patent application / legal counseling services, technical support and cooperation with the supporting organizations (p>0.05). The only significant difference found is in using office services.

According to the exportation status of the company, statistically significant difference is found in terms of the utilization level of office services (p: 0.010). As a result of the evaluations made, it is

found out that the office utilization level of the companies which export is lower than the ones which don't export.

In Table 4.4, the hypothesis H3a is tested. There is no statistically significant difference between the competitiveness of the industry that the company is in and the support utilization levels.

Table Hata! Belgede belirtilen stilde metne rastlanmadı..**4:** Comparison of the utilization level of services according to the industry competition that the company is in.

	Industry Competition Level					χ^2	p
	Very Low	Low	Medium	High	Very High		
Training	4 (3, 4)	4 (2, 5)	4 (3, 5)	4 (3, 5)	4 (3, 5)	1.264	0.867
Mentorship	4 (3, 5)	5 (2, 5)	5 (3, 5)	4 (4, 5)	4 (4, 5)	0.882	0.927
Office	4 (3, 4)	4 (2, 5)	4 (3, 5)	5 (3, 5)	5 (4, 5)	2.683	0.612
Laboratovary	1 (0, 3)	0 (0, 2)	0.5 (0, 2)	0 (0, 1)	1 (0, 1)	1.485	0.829
Advertising	3 (3, 4)	2 (1, 3)	2 (2, 3)	2 (1, 3)	3 (2, 5)	5.780	0.216
Networking	4 (4, 5)	4 (3, 5)	4 (3, 4)	4 (3, 5)	4 (3, 5)	0.444	0.979
Investment/Finance	4 (3, 5)	3 (2, 4)	3 (2, 4)	3 (1, 3)	2 (2, 5)	3.730	0.444
Meeting with Investors	3 (2, 4)	4 (2, 5)	4 (3, 4)	3 (2, 4)	4 (3, 4)	0.997	0.910
Going Abroad	1 (0, 3)	1 (1, 3)	1 (0, 3)	1 (0, 4)	2 (1, 3)	1.637	0.802
Trademark registration / Patent application / Legal Counseling	2 (1, 2)	1 (0, 4)	2 (1, 3)	2 (1, 4)	2 (1, 3)	1.323	0.858
Collaborating with organizations that support the accelerator	3 (3, 5)	3 (2, 4)	3 (2, 4)	3 (2, 4)	3 (2, 3)	2.742	0.602
Technical Support	2 (1, 3)	3 (1, 4)	2 (1, 4)	2 (1, 3)	2 (1, 4)	1.100	0.894

Kruskal Wallis test, median (Q1: first quarter, Q3: third quarter).

According to the industry competition that the company is in, there is not a statistically significant difference in terms of the utilization of training, mentoring, office, laboratory, advertisement, networking, investment / finance, meeting with investors, going abroad, trademark registration / patent application / legal counseling services, technical support and cooperating with the supporting organizations ($p>0.05$).

The hypothesis H1b is tested in Table 4.5. There is no statistically significant difference between the number of employees in the company and receiving benefit from the supports of the accelerator program.

Table Hata! Belgede belirtilen stilde metne rastlanmadı**..5:** Comparison of receiving benefit from the supports of the accelerator program by the number of employees employed in the company.

	Number of Employees				χ^2	p
	0	1-3	4-5	6-20		
Training	3.5 (3, 5)	4 (3, 4)	4 (3, 5)	3 (3, 5)	1.973	0.578
Mentorship	4 (3.5, 4.5)	4 (3, 4)	4 (3, 5)	4 (4, 5)	1.069	0.785
Office	4 (2, 5)	4 (3, 4)	4 (4, 5)	4 (3, 5)	0.713	0.870
Laboratory	0 (0, 1)	0 (0, 2)	0 (0, 1)	1 (0, 3)	2.642	0.450
Advertising	2 (1, 3)	2 (1, 4)	2.5 (2, 5)	3 (1, 5)	2.031	0.566
Networking	4 (3, 5)	4 (2, 4)	3 (3, 5)	4 (3, 5)	3.794	0.285
Investment/Finance	3 (1, 4)	3 (2, 4)	2.5 (1, 5)	4 (2, 5)	1.147	0.766
Meeting with Investors	3 (2, 4)	3 (2, 4)	3.5 (2, 5)	4 (3, 5)	2.153	0.541
Going Abroad	1 (0, 3)	1 (0, 3)	1 (0, 3)	3 (1, 4)	3.644	0.303
Trademark registration / Patent application / Legal Counseling	2 (0, 3)	1 (1, 3)	2.5 (0, 3)	1 (1, 4)	1.521	0.677
Collaborating with organizations that support the accelerator	3 (1.5, 4)	3 (1, 4)	2 (2, 5)	3 (1, 5)	1.170	0.760
Technical Support	1 (0, 3)	1 (1, 3)	0.5 (0, 2)	4 (1, 5)	7.166	0.067

Kruskal Wallis test, median (Q1: first quarter, Q3: third quarter).

According to the number of employees employed in the company, there is not a statistically significant difference in terms of receiving benefit from the services of training, mentoring, office, laboratory, advertising, networking, investment / finance, meeting with investors, going abroad, trademark registration / patent application / legal counseling, technical support and cooperation with the supporting organizations ($p>0.05$).

The hypothesis H1d is tested in Table 4.6. There is no statistically significant difference between the monthly financial turnover of the companies and receiving benefit from the supports of the accelerator program.

Table Hata! Belgede belirtilen stilde metne rastlanmadı..**6:** Comparison of receiving benefit from the supports of the accelerator program according to the company's monthly average financial turnover.

	Monthly Turnover					$\chi 2$	p
	No sales yet.	100-5000 TRY	5000-10000 TRY	10000-20000 TRY	≥ 20000 TRY		
Training	3 (2, 4)	3 (3, 4)	4.5 (3, 5)	4 (3, 5)	4 (3, 5)	8.053	0.090
Mentorship	4 (3, 4)	4 (3, 5)	4 (4, 5)	4 (2.5, 5)	4 (4, 5)	5.479	0.242
Office	4 (2, 5)	4 (3, 4)	4 (1, 4)	4 (3.5, 5)	4 (3, 5)	3.566	0.468
Laboratovary	0.5 (0, 3)	0 (0, 1)	1 (0, 2)	0 (0, 2)	0 (0, 1)	3.575	0.467
Advertising	2 (1, 3)	2 (2, 4)	1.5 (1, 2)	2 (1.5, 4.5)	3 (1, 5)	3.498	0.478
Networking	4 (2, 4)	4 (3, 5)	4 (1, 5)	3.5 (3, 5)	4 (3, 5)	2.159	0.706
Investment/Finance	3 (2, 4)	3 (1, 4)	3 (1, 5)	2 (0, 3.5)	4 (2, 5)	3.858	0.426
Meeting with Investors	3 (2, 4)	3 (2, 4)	3 (1, 5)	3 (1.5, 4)	4 (4, 5)	6.630	0.157
Going Abroad	1.5 (0, 4)	1 (0, 4)	1 (0, 3)	1.5 (0, 3)	2 (0, 4)	2.189	0.701
Trademark registration / Patent application / Legal Counseling	2 (0, 4)	1 (0, 3)	1 (1, 3)	2 (0, 3)	2 (1, 4)	2.684	0.612
Collaborating with organizations that support the accelerator	3 (2, 4)	4 (1, 4)	2.5 (1, 4)	2 (0.5, 3)	3 (1, 4)	2.939	0.568
Technical Support	2 (0, 4)	1 (0, 3)	1.5 (1, 4)	1 (0, 3.5)	2 (1, 3)	2.572	0.632

Kruskal Wallis test, median (Q1: first quarter, Q3: third quarter).

According to the monthly financial turnover of the company, there is not a statistically significant difference in terms of receiving benefit from the services of training, mentoring, office, laboratory,

advertising, networking, investment / finance, meeting with investors, going abroad, trademark registration / patent application / legal counseling, technical support and cooperation with the supporting organizations (p>0.05).

The hypothesis H2b is tested in Table 4.7. Supports that have a significant difference between receiving benefits from the supports of the accelerator program and the exportation status of the company are given below.

Table Hata! Belgede belirtilen stilde metne rastlanmadı**..7:** Comparison of receiving benefit from the supports of the accelerator program according to the exportation status of the company.

	Exportation Status		z	p
	Doesn't Export	Does Export		
Training	4 (3, 5)	4 (3, 5)	-1.532	0.125
Mentorship	4 (3, 4)	5 (4, 5)	-2.060	0.039*
Office	4 (3, 5)	3 (1, 4)	-1.347	0.178
Laboratovary	0 (0, 2)	0 (0, 0)	-2.120	0.034*
Advertising	2 (1, 4)	2 (1, 3)	-1.335	0.182
Networking	4 (3, 5)	4 (3, 5)	-1.394	0.163
Investment/Finance	3 (1, 4)	4 (2, 5)	-1.115	0.265
Meeting with Investors	3 (2, 4)	4 (4, 5)	-2.665	0.008**
Going Abroad	1 (0, 3)	2 (0, 5)	-1.108	0.268
Trademark registration / Patent application / Legal Counseling	2 (0, 3)	1 (0, 2)	-1.201	0.230
Collaborating with organizations that support the accelerator	3 (1, 4)	3 (1, 4)	-0.827	0.408
Technical Support	1 (0, 4)	2 (0, 3)	-0.031	0.975

Kruskal Wallis test, median (Q1: first quarter, Q3: third quarter).
*p<0.05 **p<0.01

According to the exportation status of the company, there is not a statistically significant difference in terms of receiving benefit from the services of training, office, advertising, networking, investment / finance, going abroad, trademark registration / patent application / legal counseling, technical support and cooperation with the supporting organizations (p>0.05). Significant

differences are found in benefiting from the services of mentorship, laboratory and meeting with investors.

According to the exportation status of the company, statistically significant difference is found in terms of benefiting from mentorship services (p: 0.039). As a result of the evaluations made, it is found out that the benefit level of the companies which export is higher than the ones which don't export.

According to the exportation status of the company, statistically significant difference is found in terms of benefiting from laboratory services (p: 0.039). As a result of the evaluations made, it is found out that the benefit level of the companies which export is lower than the ones which don't export.

According to the exportation status of the company, statistically significant difference is found in terms of benefiting from meeting with investors (p: 0.008). As a result of the evaluations made, it is found out that the benefit level of the companies which export is higher than the ones which don't export.

In Table 4.8, the hypothesis H3b is tested. There is no statistically significant difference between the competitiveness of the industry that the company is in and receiving benefits from the supports of the accelerator program.

Table Hata! Belgede belirtilen stilde metne rastlanmadı..**8:** Comparison of receiving benefit from the supports of the accelerator program according to the industry competition that the company is in.

	Industry Competition Level					$\chi 2$	p
	Very Low	Low	Medium	High	Very High		
Training	3 (2, 5)	3 (3, 4)	3 (3, 5)	4 (3, 5)	4 (4, 5)	1.921	0.750
Mentorship	4 (3, 4)	5 (4, 5)	4 (4, 5)	4 (3, 4)	4 (4, 5)	4.303	0.367
Office	4 (3, 5)	3 (2, 4)	4 (2, 4)	4 (3, 5)	4 (3, 4)	5.418	0.247
Laboratory	1 (0, 3)	0 (0, 2)	0 (0, 1)	0 (0, 1)	1 (0, 1)	2.063	0.724
Advertising	3 (2, 4)	2 (1, 4)	2 (1, 4)	3 (1, 4)	2 (1, 3)	3.651	0.455
Networking	4 (3, 4)	4 (2, 5)	4 (2, 4)	4 (3, 5)	4 (3, 5)	1.500	0.827

Investment/Finance	4 (3, 4)	3 (2, 4)	3 (2, 4)	2 (1, 4)	2 (1, 4)	3.325	0.505
Meeting with Investors	4 (3, 4)	4 (3, 4)	3.5 (2, 4)	3 (3, 4)	3 (2, 5)	1.337	0.855
Going Abroad	2 (1, 4)	2 (0, 4)	1 (0, 3)	1 (0, 3)	2 (1, 3)	2.535	0.638
Trademark registration / Patent application / Legal Counseling	3 (1, 4)	1 (0, 3)	1 (0, 3)	1 (0, 3)	2 (1, 2)	1.063	0.900
Collaborating with organizations that support the accelerator	4 (3, 5)	4 (2, 4)	3 (1, 4)	2 (1, 4)	2 (2, 4)	7.067	0.132
Technical Support	3 (1, 4)	1 (0, 4)	1 (0, 3)	2 (0, 3)	1 (1, 3)	0.665	0.956

Kruskal Wallis test, median (Q1: first quarter, Q3: third quarter).

According to the industry competition that the company is in, there is not a statistically significant difference in terms of receiving benefit from the services of training, mentoring, office, laboratory, advertisement, networking, investment / finance, meeting with investors, going abroad, trademark registration / patent application / legal counseling services, technical support and cooperation with the supporting organizations ($p>0.05$).

5. Conclusion

This study makes a statistical analysis on how startups use the services provided by the accelerator program. According to startup's employee size, average monthly turnover and exportation status, it tries to identify which startup uses and benefits from which services the most. This study is applied to the startups in chosen accelerator programs located in Turkey. A key finding from this study is that companies who have more employees utilizes advertising and networking services more compared to companies with fewer employees. Also, companies which export benefit more from mentoring and meeting with investors services compared to ones which don't export. The reason of this is that exporting is a complicated process and so startups need guidance during exportation along with capital in order to grow their operations more.

This study has limitations. One of them is that literature about accelerator programs is very scarce. There are almost no studies about startups attending accelerator programs in Turkey. Also, it was very difficult to connect with startups who graduated from the accelerator and therefore, mainly startups who were present in the accelerator during the study were represented. Future studies can study entrepreneurs who are attending accelerator programs and can look at how their

demographics affect the utilization of supports provided by the programs. Moreover, further comparative analysis on startups can be done to find out firm survival after the accelerator program.

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