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In Organizational Management; White Collar Personnel Job Satisfaction and Organizational Performance Relationship

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Abstract

The aim of the study is to examine the effect and relationship of job satisfaction of white-collar staff, who has to make decisions and take responsibilities regarding the works the organization have been conducting, its functioning, and its future by taking place in every level of executive groups in the organizational hierarchy, on organizational performance. And to contribute to an efficient organizational performance, which is one of the most important factors for businesses to achieve the goal of sustainable profitability above the average. Statistical analyses (Descriptive, Independent T Test, One Way Anowa, Correlation, Regression) were applied on the data obtained from the studies conducted upon fifty-one participants and they showed a significant relationship between white-collar staff job satisfaction and organizational performance.

Keywords: White-collar, Job Satisfaction, Organizational Performance

1. Introduction

White collar staff play major roles in upper-level management in which strategical and long-term decisions are taken; middle-level management in which the middle-term decisions are taken; and lower-level management in which the short-term, daily, weekly, monthly, annual decisions regarding repetitive and routine works. They take care of the employees, conducting of the business, and details via one-on-one contact. The white-collar staff who have a certain education and competence and put out more of an intellectual labor occupy an important place in the organizations.

Job satisfaction of the white-collar staff that has to take place in every unit of the organization and make decisions regarding its functioning and future can also affect the organizational performance.

Job satisfaction usually refers to the gratification the employees receive from the work they are doing. Employees who receive gratification and enjoyment of their work can be productive. (Öztürk 2017)

The level of satisfaction of an employee is directly related to the contribution and productivity they will procure for the organizational performance. (Bağcı 2014) Also the data obtained from Hawthorne researches shows that high spirits, motivation, and satisfaction of the employees are important factors that contribute to the increase of productivity. (Paul, 2012: 29)

Since it was thought that high job satisfaction of the white-collar staff, who take place in every unit of the organization, put out intellectual labor, and contribute to the organization by making strategic decisions regarding its functioning and future, can affect the organizational performance positively; this research was conducted in order to examine this relationship.

The main universe of the research consists of companies within the province of Kastamonu, and the sample universe consists of 55 white-collar employees such as engineers, department chiefs, first level directors, etc. who work in businesses specific to Kastamonu and were chosen on a voluntary basis.

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A survey study was made by asking 15 questions related to the job satisfaction scale and 15 questions related to the operational, commercial, and financial dimensions of the business performance scale to white-collar staff who were chosen with simple random sampling and work as engineers, department chiefs, first level directors, etc. in companies specific to Kastamonu via face-to-face interview and e-mail. The questions were formed according to the five point Likert scale (from 1: Strongly Disagree to 5: Strongly Agree).

Statistical tests *(Descriptive, Independent T Test, One Way Anowa, Correlation, Regression)* were run on the data obtained for the analysis of the relationship between job satisfaction and organizational performance using SPSS 22.0 program.

The aim of this study, in which an answer is sought to the opinion that high job satisfaction of white-collar employees can positively affect the organizational performance, is to make contributions to organizations that employ white-collar staff and their executives on how increasing job satisfaction level can improve organizational performance.

2. Literature Review

2.1. White-Collar Staff

White-collar personnel are the ones who work in the office, at the desk, and carry out the jobs that require professionalism, not with their body but with their mental power. (Thistlethwaite & Mills, 1954). White-collar employees work mostly with their intellectual abilities behind a desk in the office rather than with their bodily efforts. A wide group is in this scope from clerks to executive positions. Not working in jobs that demand manual labor, the white-collars work mostly in executive and research and development positions. This group also heavily relies on technology. We can mention many positions for white-collars; particularly production planning, engineering, production management, quality systems management and supervision, laboratory, R&D, maintenance and repair, storage, shipment, marketing, administration, and sales.

We encounter the “white-collar employees” as people who, in the procedure of turning workers’ (defined as blue-collars) physical force into work capability and production, stand out with their management and administration focused stances and adopt this as their profession, and have critical importance in running the operational activities delay-free in the organization. A white-collar employee is defined as a person who can run executive and bureaucratic works, has the ability of coordination, uses his physical strength relatively less, and generally earns more than the “blue-collar”.

According to some researches, the new age white-collars don’t only want to earn a lot of money, but also are subjects who seek meaning in their jobs beyond money, want to distinguish themselves by taking initiatives, and consider job satisfaction as a priority. So much so that it has been put forth that the white-collars think they are going to be more successful as take more initiatives and responsibilities in their jobs. (URL-1, 2017)

When the positions and responsibilities of the white-collar employees in the organization are taken into consideration; job satisfaction, which can even adjourn financial factors which are an important component in the present day, can have a notable effect on organizational performance.

2.2. Job Satisfaction

Job satisfaction can be defined as a scale of an employee’s positive feelings and attitudes toward their job (Neelamegam, 2010: 108). Job satisfaction can also be phrased as the vocational satisfaction and pleasure of an employee which they receive by successfully fulfilling their jobs within their area of responsibility in the organizational structure. (Yelboğa, 2007: 1). This situation can widely be associated with the level of harmony amongst an individual’s expectations towards the job and the organization, the qualities the job requires, the productivity expected from the individual by the organization, and their positive contributions to the organizational performance. As a matter of fact, organizations include individuals within themselves toward organizational goals such as making positive contributions to performance and productivity by running of the operations in accordance with purposes and plans, just like individuals get themselves included in organizations so as to meet their personal goals and expectations. Just like organizations evaluate employee performances and activities in accordance with organizational goals and set forth judgements as the time passes, employees too compare their expectations and gains, and set forth their negative or positive emotional reactions and evaluations towards their perceptions of job and working conditions which can affect organizational performance (Eroğluer, 2011: 123). At this juncture individual perceptions are of significance as well. Because just like every individual has different conditions of gender, education, social and cultural aspects, etc. which

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have a great effect on perceptions, as a result of these each individual's perception of different matters differs from each other and these differences also reflect on their points of view. This fact shows that every individual would have a different level of satisfaction within the structure of organization because of their different feelings and points of view. As a result, an individual may react differently to conditions another individual receives satisfaction and spiritual pleasure from, or they may not receive any satisfaction at all. As well as satisfaction or nonsatisfaction are emotional reactions definitively persons can feel, they can also be evaluated as a spiritual means for them to achieve inner peace (Karcıoğlu, Timuroğlu and Çınar, 2009: 60).

Various studies conducted on the subject have shown that job satisfaction is affected by many intra-organizational and extra-organizational factors such as "nature of business, received fee, rewards, promotions, and career possibility, social rights, importance attached to employee health and work safety, working and environmental conditions, working hours, supervision system, management approach, colleagues, job's conditions because of its nature, intra-organizational communication, employee's personality, gender, whether the work place is government or private owned" (Top, 2012: 261). Sudden changes observed in needs and perceptions of the employees who are affected by changes in the abovementioned factors leads us to the conclusion that job satisfaction has a flexible structure. As a result, it's important for organizations, which aim to provide their employees with high satisfaction, to perform activities willingly to provide the infrastructure necessary for that. For instance, while the activities the organization performs toward improving the working conditions can affect employee attitudes positively by making them feel important and valuable, not providing adequately good working conditions (insufficient thermal comfort, cleanliness, noise isolation, procurement of personal protective equipment, etc.) can lead to reduction in job satisfaction by causing physically and spiritually negative effects in employees (Eğinli, 2009: 41-42).

2.3. Organizational Performance

In order to maintain their presence in the rapidly-changing competition environment, organizations attach importance to the matter of sustainable performance development in the present day. Organizational performance can be explained as computation of an organization's ability to achieve its goals by using its inner and outer resources effectively and efficiently (Daft, 2000; Boyne, 2003). However, on an individual basis, performance can be measured according to an employee's contribution to the organization's goals, and is qualified as their actions' level of compatibility to the organization's goals (Suliman, 2001). In organizations; working and physical conditions of the business, organizational goals, management policies, and all problems which may occur based on these are determining criteria of the organizational performance. In order for organizations to adapt to the changing environmental conditions by making use of the newly-developing opportunities in our day's developing and rapidly-changing competition conditions, in other words, in order for them to survive in long-term by making enough profit, they ought to utilize performance measurement and estimation systems which are based upon inner and external examination. (Turunç, 2006). While it's not possible to create a systematic which is valid for every situation because of the hardships in measuring performance, more fructuous standards and methods are presented with each passing day. (Venkatraman and Ramanujam, 1986; Capon et. al., 1990; Beamon, 1999). Generally three techniques are used for measuring organizational performance. First is the technique that is based on objectiveness and subjectiveness of the criteria (Eusebio, 2006; Campbell, 1977). Second technique is the one that uses financial and non-financial criteria (Haber and Reichel, 2005; Lumpkin and Lichtenstein, 2005). And the third technique developed to measure organizational performance is the one that uses inner and outer evaluations (Aggarwal and Gupta, 2006). Nowadays better organizational performance measurements can be made relying on these and the more recently developed methods by organizations' own inner institutions and external auditing institutions. High organizational performance also lifts spirits and motivations of employees who have sense of corporate belonging. Significant responsibilities fall on executives in providing a high-quality communication and interaction environment amongst executives and employees of every level based on mutual trust, developing the employees' senses of belonging and emotional bonds for the corporation, motivating them so as to maximize their job satisfaction, and as a result, increasing the organizational performance. (Çalışkan, Akkoç and Turunç, 2011

3. Collection and Analysis Of The Data

The main universe of the research consists of large industrial establishments, which are limited in number in Kastamonu. And the sample universe consists of 55 persons who were chosen with simple random sampling method and are white-collar employees working as engineers, department chiefs, first level directors, etc. in large industrial establishments specific to Kastamonu. Face-to-face interviews and e-mail survey studies were conducted with the

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employees. The data were analyzed over 51 surveys since 4 of the surveys which were received via e-mail were faulty and left out of assessment.

The participants were directed to the project with a total of 35 questions according to the number of likes (1: I strongly disagree, 5: I strongly agree). The demographic drawing of the survey for the first 5 years consists of the patterns of job satisfaction from 1 to 15, business performance in the detailed model from 16 to 30, commercial and performance processes.

The scale used in the research; Tiyek (2011), Şencan, Aydıntan, Yeğenoğlu (2017); Geylan, Baraz (2017); Acaray (2014); Efeoğlu, Özgen (2007) was created using the scales used in their studies.

Statistical (Descriptive, Independent T Test, One-Way Anova, Correlation, Regression) tests were applied to the data obtained for the analysis of the relationship between job satisfaction and organizational performance.

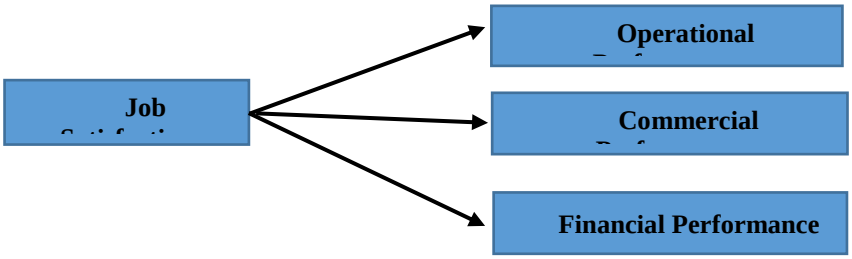
4. Scope and Limitations Of The Research

The fact that the number of large industrial establishments employing white-collar personnel in Kastamonu is low, they operate in the service, food, wood and building materials sectors, and 55 people can be surveyed due to the limited interview conditions regarding the Covid-19 process; It constitutes the scope and limitations of the research in terms of generalization to all sectors and making it in the wider universe. The study was carried out between March and June 2020.

5. Model and Hypotheses Of The Research

The model of this study, which aims to investigate the relationship between job satisfaction of white-collar personnel working in organizations and business performance scale, and the sub-dimensions of business performance scale: "Operational Performance", "Commercial Performance" and "Financial Performance". The part of the research model created by Akkoç & oth. (2012) that shows the effect of job satisfaction on job performance was created with reference. The models and hypotheses created are as follows.

Figure.1 Model of the Research



H1: White-collar employees' job satisfaction has an effect on organization's performance.
H1/1: White-collar employees' job satisfaction has an effect on organization's operational performance.

H2/1: White-collar employees' job satisfaction has an effect on organization's commercial performance.

H3/1: White-collar employees' job satisfaction has an effect on organization's financial performance.

6. Research Findings and Comments

6.1. Demographical Features of Participants

Genders, marital statuses, and educations of the survey participants are shown in the table 1.

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Table 1. Gender, Marital Status, and Education Distributions of Survey Participants

Distribution According to Marital Status			
Gender / Education	**Male**	**Female**	**Total / %**
Number /	**%34 – % 66,6**	**17 – % 33,3**	**51 - % 100**
Married	**26**	**14**	**40-% 78,4**
Unmarried	**8**	**3**	**11 - % 21,6**
Distribution According to Educational Status			
High School	**4**	**0**	**4 - % 7,85**
Two-year Degree	**4**	**1**	**5 - % 9,8**
License Degree	**17**	**11**	**28 - % 54,9**
Master's Degree and Higher	**9**	**5**	**14 - % 27,5**

According to the table, 2/3 (66,6%) of the 51 persons who composes the sample universe of the research are males. 78,4% of the participants consists of married people, and as for educational status 54,9% has a license degree and 27,5% has a postgraduate education. The fact that 82,4% of all participants have a license degree or a higher education shows that the employees called white-collars in executive positions consists of people with license degree or higher education.

Table 2. Distribution of Total Experience, Term of Employment, and Terms of Employment According to Total Experience

Total Experience (Years-%)		**Term of Employment (In the Same Corporation) (Years)**					
			Less than 1	**1-5**	**6-10**	**11-20**	**20 and Above**
Less than 1	**0-%0**	**1 - % 2**	**0**	**0**	**0**	**0**	**0**
1-5	**4-%7,8**	**14-%27,5**	**1-%25**	**3-%75**	**0**	**0**	**0**
6-10	**16-%31,4**	**14-%27,5**	**0**	**8-%50**	**7-%43,8**	**1-%6,3**	**0**
11-20	**14-%27,5**	**11-%21,6**	**0**	**1-%7,1**	**7-%50**	**6-%42,9**	**0**
20 and Above	**17-%33,3**	**11-%21,6**	**0**	**2-%11,8**	**0**	**4-%23,5**	**11-%64,7**
Total	**51-%100**	**51-%100**					

In Table 2 are given the total work experience of the working group, terms of employment, and distribution of terms of employment according to total experience. According to the table it is understood that the participants who have less than 1 year of experience in their organization or those who have been working in the same organization for less than 1 year are not assigned as white-collar employees. Again, according to the table, it is seen that white-collar employees are mostly chosen from those with 6 or more years of experience and have been working in the same corporation for more than 1 year. Besides, 17 white-collars with 20 years or more experience constitute the majority of the participants with the ratio of 33,3%, and this group also takes the second place with the ratio of 21,6% (11 persons) in terms of term of employment in the same corporation. It is seen that 11 of the 17 white-collars with 20 or more years of experience with the ratio of 33,3% have been working in the same corporation for more than 20 years or more, making up a ratio of 64,7%. In the light of all these information it is seen that white-collar staff are mostly chosen among those with 6 or more years of experience, as a result their terms of employment in the same business are parallel to their experience or correspond to one lower option of total work experience stated in the scale, and they have been working in the same corporation for a long time. Since they have been working in the same corporation for a long time it can be said that they are an important employee within the organization or that low white-collar staff circulation in an organization is closely related to organizational performance.

6.2. Scale Validity and Reliability Analysis

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Cronbach's Alpha analysis was conducted for the reliability analysis of the scales and their sub-dimensions, and factor analysis was conducted for the validity analysis; their results are as in Table 3.1 and 3.2.

Table 3.1. Factor Analysis Findings – Job Satisfaction

Factor	Question Statement	Factor Weights	Factor Explanatoriness (%)	Reliability
Job Satisfaction Scale.	1-I'm able to use my knowledge and skills related to my job.	,691	38,75	,866
	2-I'm able to work independently in my job	,607		
	3-My job provides respectability and prestige in the society.	,695		
	4-I often feel accomplished thanks to my job.	,630		
	5-My suggestions related to my job are taken in consideration.	,669		
	6-I have a voice in decisions taken about my job.	,811		
	7-I'm able to progress in my job.	,751		
	8-I'm content with physical working conditions.	,776		
	9-I like my supervisor's approach and supervising style in solving problems.	,659		
	10-My efforts are appreciated when I do my job well.	,663		
	11-My corporation addresses to professional development (In service training, etc.).	-		
	12-I think my wage is fair.	,628		
	13-I think social rights and rewards are good compared to other institutions.	,690		
	14-I spend time with my colleagues outside of work.	-		
	15-I can easily share my problems with my colleagues.	-		
Total Variance Explaining Ratio			%38,75	
Kaiser Meyer Olkin Scale Validity			,753	
Barlett Sphericity Chi-Square			390,894	
Sd			105	
P Value			,00	
Reliability Parameter			,866	

Table 3.2. Factor Analysis Findings – Corporate Performance

Corporate Performance Scale				
Operational Performance	16-Our final product cost.	,761	27,855	,798
	17-Our product quality.	,785		
	20-Corporate reputation of our business.	,698		
	23- Corporate and brand image of our corporation	,452		

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	24- Customer loyalty to our corporation	,657		
Commercial Performance	18-Innovation capacity in developing new products.	,782	19,680	,840
	19-Speed and diversity of releasing new products.	,866		
	21- Compatibility of market expectations and what our corporation offers.	,627		
	22- Our Corporation's success of releasing new products into the market.	,706		
	25-Our corporation's customer satisfaction	,412		
Financial Performance	26-Profitability of our corporation.	,619	17,865	,852
	27- Sakes volume of our corporation.	,728		
	28- our corporation's financial results, revenue, etc.	,854		
	29- Production capacity of our corporation	,792		
	30- Market share of our corporation	,745		
Total variance Explaining Ratio			%65,4	
Kaiser Meyer Olkin Scale Validity			,705	
Barlett Sphericity Chi-Square			503,171	
Sd			105	
P Value			,00	
Reliability Parameter			,897	

Reliability analysis was conducted to designate the internal consistency of the statements in the survey form, and factor analysis was conducted to understand and easily interpret the relationships amongst variables, and to reduce the number of variables. Job satisfaction scale was evaluated as a single factor, and Cronbach's Alpha value was found to be 0,866 and KMO value was found to be 0, 753. With the factor analysis applied to the corporate performance scale 3 factors were found. Cronbach's Alpha value was found to be 0,897 and MKO value was found to be 0, 705. In accordance with these values it can be said that the scale has high validity and reliability at 0,05 significance level, and the data set is suitable for analysis. (Kalaycı, 2017, 405; Kozak, 2017: 150; Çokluk et al., 2012: 207).

6.3. Normal Distribution Test Findings

Table 4. Normality Test Findings

Factors	Statistical Data
Job Satisfaction	Skewness: -1,056
	Kurtosis: 2,119
Operational Performance	Skewness: -0,642
	Kurtosis: 1,138
Commercial Performance	Skewness: -0,142
	Kurtosis: -0,968
	Skewness: -1,046

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Financial Performance	Kurtosis:	2,108

The frequency analysis findings applied to the scale questions are also given in Table 4, skewness and kurtosis values, Liu & oth. (2009) stated for the 95% confidence interval, since it was between -2.58 and +2.58, the data were considered to be normally distributed. T and Anova Tests were applied in the analysis of differences in the research.

6.4. T-Test Findings

Only the data belonging to the scales that showed a meaningful divergence were taken into the study from the conducted T-test analyses so as to make them intelligible.

The results of the T-test which was conducted to understand if White-collar Job Satisfaction perception and Organizational Performance differs according to gender are shown in the Table 5.

Table 5. T-Test on the Relationship between "White-Collar Staff Job Satisfaction and Organizational Performance Scales" and Gender

Scales	Gender	N	Average.	Std. Deviation	Std. Error	P
Job Satisfaction	Female	17	3,44	,668	,162	0,04
	Male	34	3,92	,475	,081	
Organizational Performance	Female	17	3,41	,578	,140	0,011
	Male	34	3,82	,479	,082	

According to the T-test findings on the relationship between "white-collar staff job satisfaction and organizational performance" and gender as seen in Table 5, it is concluded that differences in job satisfaction and organizational performance perceptions according to gender are meaningful since it is P<0,05 for both scales. While the answers of females to job satisfaction scale questions are close to "indecisive" with an average of 3.44, answers of males are close to "agree" with an average of 3,92. Also the females' answers to organizational performance scale questions are close to "indecisive" with an average of 3,41; the males' answers are close to "agree" with an average of 3.82. While it is seen that female participants are indecisive about their job satisfaction perceptions and corporate performance in their corporations, male participants have positive opinions on both scales.

6.5. Anova Test Findings

Again, in order to provide intelligibility, only data belonging to the scales that shows a meaningful divergence are taken into the study from the conducted Anowa analyses. LSD test was conducted to detect which groups the divergences are resulting from.

Anowa test was conducted in order to understand if the corporate performance differs according to white-collar staff's terms of employment in the same corporation, and the obtained results are given in the Table 6.

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Table 6. Anowa Test on the Relationship of White-Collar Staff's Terms of Employment in the Same Corporation and Corporate Performance Scale

Scales	Terms of Employment in the Same Corporation	N	Average.	Std. Deviation	F	P	LSD
Corporate Performance	Less than 1 Year	0	-	-	2,39	,081	6-10 / 11-20 Above 6-10 / 20 Above 20 / 11-20
	1-5 Years	15	3,74	,544			
	6-10 Years	14	3,51	,560			
	11-20 Years	11	4,01	,330			
	Above 20 Years	11	3,50	,592			
	General Total/ Average	51	3,69	,544			

When the results of the conducted Anowa test are examined it is seen that only only Corporate Performance scale shows a meaningful divergence in accordance with Terms of Employment in the Same Corporation. It is also seen that the divergence derives from the results between those who have worked in the same corporation for 6-10 years, 11-20 years, and above 20 years; and those who have worked in the same corporation for 11-20 years, and above 20 years.

In light of the obtained data it can be said that corporations which employ their employees continuously for 11-20 years have a higher performance.

6.6. Correlation Analysis Findings

Table 7. Correlation Table

	Job Satisfaction	Corporate Perf.	Opr. Perf.	Financial Perf.	Commercial Perf.
Job Satisfaction	1				
Corporate Perf.	,616**	1			
Opr. Perf.	,463**	,716**	1		
Financial Pef.	,395**	,819**	,314*	1	
Commercial Perf.	,647**	,910**	,556**	,634**	1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

The Pearson Correlation Analysis applied to the scales and factors is shown in the Table 7, and it is seen that there's a positive and medium-level relationship between job Satisfaction Scale and Corporate Performance Scale. While a positive low-level relationship can be observed between Job Satisfaction Scale and Operational and Financial Performance Scales, a positive medium-level is seen between Job Satisfaction Scale and Commercial Performance Scale. It can be said that an increase in job satisfaction level will make a positive contribution on corporate performance, being primarily on commercial performance.

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6.7. Regression Analysis Findings

Table 8. Regression Table

Model Summary	Parameters								
	Dependent Variable: Corporate Performance								
	R^2	Improved. R^2	F	P	DW	B	β	t	p
Independent Variable: Job Satisfaction	,380	,367	29,996	0,000	1,778	,570	,616	5,477	0,000
	Dependent Variable: Operational Performance								
	0,214	0,198	13,345	0,001	2,163	0,525	0,463	3,653	0,001
	Dependent Variable: Commercial Performance								
	0,418	0,406	35,209	0,000	1,615	0,687	0,647	5,934	0,000
	Dependent Variable: Financial Performance								
	0,156	0,139	9.078	0,004	1,885	0,466	0,395	3,014	0,004

When the regression analysis findings given in the table are examined job satisfaction is seen to affect corporate performance positively and meaningfully (B:0,570). It is seen that job satisfaction meaningfully and positively affects all three of the performance factors, highest effect being upon commercial performance factor (B:0,687).

All research hypotheses were approved in this scope.

H1: White-collar employees' job satisfaction has an effect on organization's performance. **APPROVED**

H1/1: White-collar employees' job satisfaction has an effect on organization's operational performance. **APPROVED**

H2/1: White-collar employees' job satisfaction has an effect on organization's commercial performance. **APPROVED**

H3/1: White-collar employees' job satisfaction has an effect on organization's financial performance. **APPROVED**

7. Conclusion and Suggestions

They play important roles in organizational hierarchy such as upper-level management in which and long-term decisions are taken; middle-level management in which the middle-term decisions are taken; and lower-level management in which the short-term, daily, weekly, monthly, annual decisions regarding repetitive and routine works. They take care of the employees, conducting of the business, and details via one-on-one contact. The white-collar staff who are in lower-level management unit positions have a certain education and competence and put out more of an intellectual labor occupy an important place in the organizations. Their positions have gained more importance in corporations in today's developing and sudden-changing conditions.

In the conducted studies it has been seen that white-collar employees ha a certain education and experience. While it can be mentioned that corporations with lower circulation speed and higher employment terms for white-collar employees have a higher performance, employees with a high job satisfaction would also have longer terms of employment.

In parallel with similar studies in the literature, this study showed that as the job satisfaction level of the employees increases, their job performance also increases, and the organizations' intense and fast changing economic, strategic etc. Organizational performance increases due to their ability to adapt to competitive conditions. (Yorlmaz & oth., 2017). It has also been determined that job satisfaction has a positive effect on organizational performance. (Akkoç & oth., 2012).

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In conclusion, in organizations whose main purpose is to achieve above-average sustainable profitability targets, as job satisfaction of white-collar employees increases the organization's performance and profitability, which is its purpose of foundation, will also increase; and a study with a larger scale and more participants will provide contributions and guidance to upper-level managers on increasing corporate performance and success, and on strategies of developing their human resources.

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Niche Construction Theory, Cognitive Evolution and Evolution of Constructivity & Architecture

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Abstract

Since the beginning of human history, humans benefit from architectural settings to increase their survival chances. Thanks to its evolutionary primacy and precedence for life, architectural settings have shaped human biology, mind, behaviour, ecology, and socio-culture. The architectural environments have been shaped by these issues reciprocally. Niche construction is the process by which an organism alters its familiar environment. The alterations can be a physical alteration to the organism's environment. Alternatively, it may include an organism actively moving from one habitat to another to experience a unique environment. This article's primary motivation is to draw attention to the influential reciprocal profit and relationships between architectural environments and their users and designers by emphasizing the significant role in human life, from genetics to culture. This paper's contribution is to discuss some linking mechanisms to understand the significant value of architecture for human cognitive evolution and adaptation.

Key Words: Human and environment, architectural setting, niche construction theory, cognitive evolution

1. The background

From the beginning of human history, architectural design -as an activity to modify physical environments following human needs- have been entangled in other aspects of human life. The modified natural environments have become templates containing cognitive and socio-cultural traces. So, these settings modified human behaviours and maybe genetics to some degree. Due to the strong anthropocentrism in architecture, architectural settings have been examined under unidirectional perspectives. This approach has accepted that architectural settings as physical settings that are fulfilling human requirements. Their influence on our behaviours, phenotypes, genetics, cognitive and neural mechanisms, and socio-cultural traits have been ignored. Thanks to the phenomenological tradition and life philosophies drawing attention to human life's unique characteristics and experience and accepting objects and environments as the extension of existential being. Some approaches such as cybernetics, general and dynamic system theories, the influential roles of environments, objects, materials, body on human cognition, behaviour, socio-cultural traits have been begun to be examined. They have generated new models and terms approach based on examining complex phenomena such as life or cognition as a system and reciprocal relationships between these systems' elements (Jones et al., 1994; Laland & Galef, 2009).

One of the most comprehensive theories examining the influential reciprocal role of artefacts of the living on every aspect of their life from genetics to memes is ‘Niche Construction Theory’, coined in 1988 by Oxford biologist John Odling-Smee. Unlike standard evolution theories, Niche Construction Theory considers genetic inheritance and ecological inheritance; here, the livings are estimated as active agents when faced with environmental stress situations or natural selections. They challenge these selection pressures or stress conditions with their artefacts containing their sensorimotor and cognitive capabilities. Nests, burrows of animals, nitrification process of plants and clothes, architectural settings and other cultural traits of humans can be accepted as constructed niches against these pressures in the natural environment (Odling-Smee et al., 2013). However, differently from plants and animals, constructed niches of humans have evolved very dramatically. Another interesting fact about humans in niche construction is that humans

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can construct niches in different forms such as neural niche, cognitive niche, social niche and cultural niche, and ecological niche (McNair, 2016; Blute, 2010).

The cognitive niche can be defined as cognitive artefacts to challenge environmental pressures and neural niches. Neurogenesis increase brain functions for adaptation. The extended mind can extend the mind into the environment to increase the survival capacity via artefacts such as architecture. In this sense, architectural settings become cognitive extensions of the human mind. Moreover, this extension potential of architecture makes the nature of the architectural experience more complicated and stratified. In this view, designing architectural settings can be seen as a problem-solving activity against natural environments pressures, and aesthetical judgements can have some survival background.

2. Niche Construction Theory and Architecture

We were creating and using architectural settings that have priority and precedence compared with most other human activities. Thanks to these attributions, examining these settings on only physical levels will become superficial. They contain various aspects of human life and traces of human cognitive capabilities and socio-cultural traits. One of the other reasons beyond their complicated nature is the continuous interaction of us with them. As a result of the continuous reciprocal processes, architectural settings shape the living forms. One of the exciting and dramatic influences of architectural settings on human behaviour and cognition emerged in human history nearly 2,5 million years ago. According to evolution theory, Australopithecus species like primates were living on trees and constructing arboreal nests. After the emergence of the first *Homo* species, *Homo habilis* species such as *Homo gautengensis* and *Homo rudolfensis* began to construct terrestrial nests instead of arboreal nests. The main reason beyond this change was to increase the quality of sleep and comfort. The changing the ground of architectural setting on which they were built brought about dramatic changes in human bodily posture, behaviours and brain structure. In body posture, the human species became more terrestrial, and their backbone became more erected. They began to benefit from the advantages of bipedalism. Their hand evolved in order to manipulate materials instead of climbing trees. Due to the increasing environmental stress positions and natural selection pressures, cognitive capabilities and cranial capacity evolved. Because of the increased number of predators in terrestrial environments, their brain areas related to face recognition are developed. Increased group sizes and new primitive social norms for sharing and obtaining food and social cooperation against environmental pressures and complexity of the terrestrial environments triggered new functional areas in the brain and encephalization process. They contributed to the formation of the theory of mind. The increasing sleep quality and the emergence of daydreaming contributed to generating visuospatial simulations. For example, hunting and escaping from animals in imagination and contributed to encephalization and improving cranial capacity. Furthermore, exploring new areas on the terrestrial ground contributed to spatial cognition. These evolutions in human cognition and body posture begot the use of fire and making stone tools (Coolidge et al., 2014, p.177-204).

These reciprocal relationships between environmental pressures and human artefacts containing cognitive and socio-cultural relationships can be examined via Niche Construction Theory as aforementioned. Differently from Standard Evolution Theory, Niche Construction Theory emphasizes co-evolution of genes and cultures /development and examines phylogenetic evolution with ontogenetic development concurrently. The constructed niches of early *Homo* species contributed to the body posture and bipedalism to increase the survival chance and new artefacts. For example, fire and manipulating materials such as tools generating and nest constructing contributed to brain and body & phenotypic plasticity and consolidated adaptation. Reciprocal relationships between artefacts of living species and environmental pressures are among Niche Construction Theory's main issues. Moreover, constructing niches is very prevalent not only in humans but also in animals. One of the best examples of constructed niches is nests and burrows. Among animals, there are many species constructing niches. Kevin Laland and Kim Sterelny, in the articles entitled 'Perspective: Seven Reasons (not) to Neglect Niche Construction' classified some species displaying nest constructing behaviours (Laland & Sterelny, 2006). Another interesting fact that most of the species displaying nest-building behaviours are clustered in some families in their phylum or order. This causes us to consider whether genes drive the nest-building behaviour among animals or architectural design in humans. It mentions the existence of architectural genes. However, these issues are out of the scope of this study.

Differently from animals, constructed niches of humans are more diversified. In literature, there are some terms to define different forms of constructed niches by humans, such as neural niche, cognitive niche, social niche and cultural niche, and it can be extended. Also, the adaptation speeds of humans to each type of constructed niches are different from each other. Moreover, these gaps generate adaptive lags between created environments and changes in these

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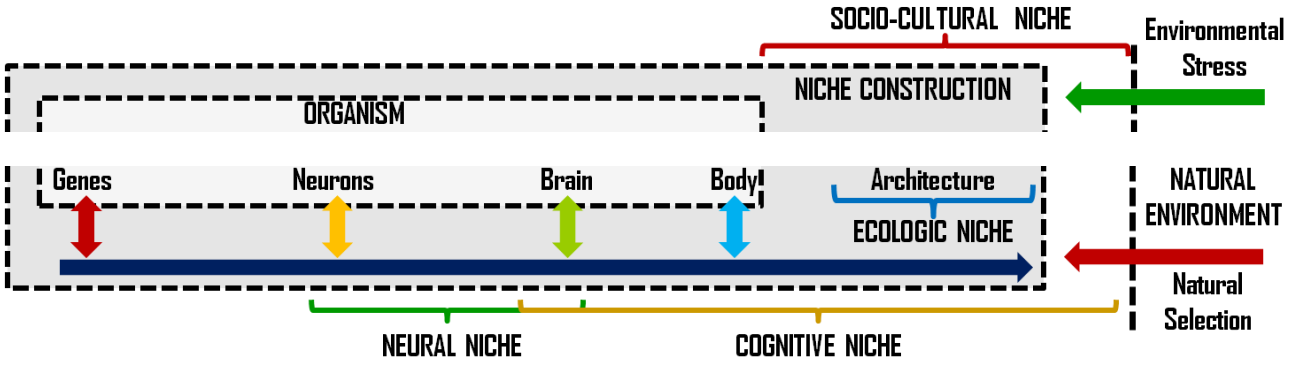
environments. Adaptive Lag Theory is one of the sub-theory of Niche Construction Theory and memetics, emphasizing the inconsistency between the rate of adaptation of organisms and environmental changes. One of the main reasons for

the adaptive lag in humans is that the speed of cultural niche construction is more than the pace of humans' adaptation to these niches. In modern culture, this lag is also valid for cognitive niche construction. There are some examples of these adaptive lags in humans. One of the most impressive examples is taking a person to one hunter-gatherer tribe from its environment and putting him into a very complicated metropolitan area like London or New York. There will be lags in his adaptation to these new environments. In this perspective, skeuomorphic design attitude can be assessed to increase cognitive adaptation to industrial design products as cultural niche construction elements via familiarity.

Figure 1: The graphic shows the forms of niche constructions of humans and architecture as ecologic, socio-cultural, and cognitive niche (Source: Author) developed by the ideas of (Odling-Smee et al., 2013).



We know there are also some different theories linking humans' biological basis with their cognition, artefacts such as Extended Phenotype, social and cultural traits. For instance, Extended Phenotype Theory examines artefacts of living beings as the extension of their phenotype and phenotypes as the extension of genes. Richard Dawkins coined the theory in 1982 via his book entitled 'The Extended Phenotype'. He constructed his theory on his concept of the selfish gene and his approach to gene-based evolution. According to him, selfish genes influence phenotypic effects and affect artefacts as extended phenotypes favouring their evolution. The owner's anatomy shapes the nests of animals and the architectural settings of humans. However, this theory ignores the role of nests and architectural settings on their owner's genes. It also ignores the relationships between genes and artefacts unidirectional, not reciprocal (Dawkins, 1982).

Another explanation linking organisms' biological basis to their artefacts, such as architecture and nests, burrows, was coined by physiologist Scott Turner as Extended Organism in 2001 through his book with the same title. According to his theory, architectural settings, nests, and burrows are not frozen agents, and their role is to assist their owners' physiological mechanisms. In his perspective, relationships between artefacts and their owners are active, and these artefacts are the indicators of their owners' cognitive capacity. In his view, he constructs some links between the physiological mechanisms of the cell to organism and colony level. He assesses artefacts such as architectural settings, nests, and burrows as the extension of the physiology of organisms regulating chemical matter and energy flow in favour of the organism. Although Turner's approach has similarities with niche construction theory, his main scope is on animals' built structures (Turner, 2000).

Thanks to the comprehensive nature of Niche Construction Theory dealing with artefacts of living beings and their links with natural selection and inherited niches, not only ecological niches but also different forms of niches (neural, cognitive, social and cultural) at the same environment make this theory more suitable to investigate the complicated and layered structure of architectural experience. This theory also suggests a framework for understanding humans'

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artefacts in a more inclusive perspective, including many aspects from genetics to cognition, from social behaviour to cultural traits. It can play a crucial role to link biological sciences to humanities and social sciences.

3. Neural and Cognitive Niche Construction and Parietal Cortex Evolution in *Homo sapiens*

Humans generate various niches differently from animals and plants—neural and cognitive niche construction associated with architectural environments—the elements of 'neural niche' based on the three concepts. The first is the production of neurons for increasing brain plasticity when an organism faced with selection pressures (neurogenesis), second is the axon, synapses and myelin production (axonogenesis and synaptogenesis and myelinization), third is the relationships between brain and body mass of an organism (brain expansion and encephalization). Expansion in brain functions and functional regions increase in the amount of white and grey matter. The main locomotives beyond neural niche construction are the polysemic, redundant and plastic structure of the brain. Neural niche construction can be assessed as the main locomotive of cognitive niche construction. Grammatical language and the ability to construct second-degree social relationships not based on kinship are humanity's most critical cognitive artefacts. However, the main problem under the scope of this study is to link architectural settings as ecological niches to cognitive and neural niches. So, cognitive niche construction can be expressed as total cognitive artefacts of organisms generated for challenging selection pressures.

One of the most contributing research was made by Atsushi Iriki and Miki Taoka about linking ecological niche construction to neural and cognitive niche construction. They conducted an experience examining Japanese macaques' tool-use behaviour and observed some parietal cortex extension in their brain after two weeks of training. As it is already known, the main two areas in the brain related to spatial orientation and navigation, bodily ownership and proprioception, which are the basis of architectural experience and understanding architectural spaces as ecological niches. In their study, it is examined the relationships between the posterior parietal cortex. The area corresponds to the superior parietal cortex in humans. It is responsible for spatial cognition in a conventional way and the inferior parietal cortex, which is coding body schema in monkeys. This fact is also responsible for understanding body schema and non-spatial cognition, such as the cognitive background of tool use and different cognitive abilities such as language, abstract and mathematical thinking. Their main idea beyond their experiment is that the inferior parietal cortex is evolved newly in humans compared to the superior parietal cortex thanks to the tool-using behaviour. They claimed the parietal cortex integrates the brain's cognitive background to create an ecological niche of architectural settings. This is associated with the superior parietal cortex responsible for spatial cognition- and neural & cognitive niches –associated with the inferior parietal cortex responsible for non-spatial cognition. They also associated spatial coordination and movement emerging tool-using to create different spatial thinking forms from concrete to abstract spaces. This situation linked the extension of inferior parietal cortex formation with working memory which is very active while using tools. The experiment allows us to investigate relationships between the cognitive basis of manipulating physical spaces as architectural activity and other forms of cognitive abilities (Iriki & Taoka, 2012).

However, tool-using as manipulating materials for defined purposes such as hunting can be associated with constructing behaviour and construction activity, including tool-generating and using. Since in construction activity, similarly tool production and use, organisms need to manipulate materials and integrate them in very complicated ways, especially among highly evolved vertebrates, especially Passeriformes in birds and Supraprimates (rodents and monkeys) in mammals. As aforementioned, even construction behaviour is more prevalent when compared with the tool using or producing tools. This perspective may be assessed as one indicator of the primacy of construction behaviour compared to tool-using or producing. Also, during architectural design, different cognitive abilities related to space emerge and the tool using or producing. When architects design architectural settings from the beginning of the conceptual level to the construction level, they manipulate spaces. They have integrated materials to the spaces in different layers; they have produced spaces such as conceptual spaces, spaces as objects, temporal or social spaces conceptually, inner and outer space discrimination.

The complicated nature of the architectural design process is prolific in terms of cognitive development compared to producing tools. Mike Hansell, the author of 'Animal Architecture and Building Behaviour' (Hansell, 2005) and 'Built by Animals' (Hansell, 2009), claims three differentiating human architecture points from animal architecture. One of the

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most exciting aspects among the others is scaffoldings as the borderline condition between tool using and construction. As it is known, scaffoldings are both tools for constructing and constructions in themselves. In research dealing with the animal tool, they can be assessed as associative tool-using. However, associative tool using is rare among animals. Moreover, the associative tools are not seen as construction functions. It can be assessed as one of the superior cognitive capacities of human beings, which emerges from cultural niche construction. Because scaffoldings have possibly not been used by hunter-gatherer societies, agrarian societies might have been used (Hansell, 2005).

4. Evolution of Constructivity, Architecture and Parietal Cortex-oriented Brain Evolution

Anthropologists made critical attempts to stress the significant role of construction behaviour in human evolution. Robert Yerkes, Jordi Sabater Pi, and Colin Groves have made outstanding contributions on this point. Differently from the central tendency based on relating cognitive evolution of hominids with tools producing and using, they stress the significant role of constructing human evolution. For instance, Comparative Psychologist and Primatologist Robert Yerkes examined the construction behaviours of apes and tried to construct some links between hominid construction behaviours in his book 'The Great Apes, a Study of Anthropoid Life' in 1929 and coined the term Evolution of Constructivity (Yerkes and Yerkes, 1929). Anthropologist Jordi Sabater Pi examined the relationships between the construction behaviours of apes and African Mbuti Pygmies. One of the pioneers of architectural anthropology Nold Egenter examined these ideas, and he generated a new model classifying the evolution of constructive behaviour and their manifested products. In his paper entitled 'The Deep Structure of Architecture: Constructivity and Human Evolution' (Egenter, 2001), he defined seven interactive processes involved in increasing brain size in his article. We can list them as;

- The transition from root to artificially stabilized buildings, which offered, first, the potential for site selection, combinations of materials and consequently a high potential for formal and functional variations with increasing complexity and stability
- The development of (topo-) semantic architecture (signs for migration, dwelling, food control)
- The potential of other derived artefacts (traps, baskets, storage, weapons, etc.)
- The development of domestic architecture from semantic architecture (access-place scheme)
- The development and implications of controlled fire derived from semantic architecture (symbolisms of fire).
- The development of polarity and the cognitive integration of natural forms into human perception; polarity can be considered the 'primary ontology' of hominids since the Middle Paleolithic may be related already to early *Homo sapiens*
- The development of language (relatively late) (Egenter, 2001).

The construction behaviours include using and producing special tools for construction and includes manipulating different spaces in different ontological levels from physical or concrete to semantic and conceptual spaces concurrently—this complicated nature of designing and constructing needs multi-sensorimotor and multi-cognitive integration. Also, using architectural entities requires the same cognitive processes. Because of this complexity, to understand the neural mechanisms beyond architectural design and using built environments, we need to examine the association areas responsible for multi-sensorimotor and cognitive integration in the cerebral cortex. These areas are in the integration regions of the parietal, occipital and temporal cortex. However, the frontal cortex's association area is different from the other three cerebral cortices in the prefrontal cortex. The parietal cortex is responsible for spatial cognition and proprioception; we need to focus on its association area. The inferior parietal lobule, which is thought lately, evolved when compared with the superior parietal cortex. This case must be in the area integrating information that comes from the occipital (responsible for visual perception) and temporal cortex (responsible for emotions and memory) and, to some degree, the limbic system (responsible for emotion, behaviour, motivation, long term memory, spatial memory). We can make inferences roughly near areas to each cortex responsible for supporting different architectural experience parts at the neuronal level. We can assume that regions of the inferior parietal cortex near to occipital lobe is responsible for visual perception during architectural design and user experience, and areas near to limbic system and temporal lobe is responsible for memory (working-short term memory, long term memory), emotions, motivations, and different sensations such as gustatory and auditory sensations. One interesting point is that the inferior parietal cortex is also related to language (linking Wernicke's area and Broca's area-two areas responsible

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for speech), abstract thinking, mathematical operations, and understanding body schema. Because of that, there must be some links between architectural experience and these cognitive skills. Before examining links between them, it will be helpful to briefly examine the parietal cortex's significant role in human evolution and the parietal cortex's functions (Laland & Sterelny, 2006; Odling-Smee et al., 2013; Turner, 2000).

The parietal cortex is responsible for heterogeneous cognitive activities from speaking to spatial encoding and spatial reasoning. We may mention them here from understanding body schema to mirror neuron activity-understanding others/ theory of mind, from object recognition to somatosensory integration, from haptic sense and grasping to spatial navigation with the help of hippocampus, from movement coordination to abstract reasoning and mathematical thinking and so on. Thanks to its complexity and diversity of functions and their significant role in survival in the natural environment and capacity for generating culture, this area must have a significant role in human evolution. Scott Elias made significant contributions examining the parietal chord capacities of *Homo erectus, Homo neanderthalensis* and *Homo sapiens* and their relationships between innovation and creativity. His book entitled 'Origins of Human Innovation and Creativity' represented a graph depicting their cerebral cortex lobules' comparisons. His graphs enlighten why *Homo neanderthalensis* were extinct even though they had bigger brains than *Homo sapiens* (Elias, 2012, p.1-15).

We know *Homo neanderthalensis* had a bigger frontal cortex, but *Homo sapiens* have a larger parietal cortex. Furthermore, according to the general view about their extinction, they cannot speak as much as *Homo sapiens*. We can extend this theory by benefitting from current findings of the functions of the parietal cortex. It can be said that *Homo neanderthalensis* were also incapable of the other parietal cortex functions compared with the Sapiens species. Diversity and heterogeneity of parietal cortex functions and its primacy for evolution and architecture give us a chance to examine the relationships between the other types of cognitive abilities such as language or social cognition or else mathematical/ abstract thinking and architectural cognition furthermore to search the complex nature of architectural experience and its uniqueness for human evolution (Akazawa et al., 2013).

Conclusion

Due to the continuous reciprocal interaction between built environments and their users, built environments become stratified, containing incoherent categories from the most concrete to the most abstract entities about human life and integrated into unified phenomena. The niche construction theory is discussed in this article to stress architectural settings' role on brain and mind activity. We understand that owing to architectural settings' inclusive structure and continuous interaction with them, examining architectural settings' role on human neural/mental activity is very important. We say the significant role of artefacts of organisms on evolution-from cognitive evolution to socio-cultural evolution- is assimilated in favour of genes. However, humans' architectural settings and animals' nests increase their survival chance and allow genetically-week individuals to survive.

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Content Analysis For The Place And Future of The Certified Public Accountant Profession in Independent Audit

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Abstract

The globalizing world, growing economic structures, institutions and businesses have increased the importance of the feeling of trust that financial information is accurate. This situation caused the independent audit activities and independent audit institutions to gain a place in the world rapidly. Interest in the audit increased due to the decrease in the confidence of the information users in the financial statements over time. Therefore, information users can make the right decisions by taking advantage of the audit to reach accurate and reliable information and make their investments accordingly. This research was conducted to determine the "Content Analysis of the Sworn-in Certified Public Accountant Profession in Independent Audit and Its Future". In line with this purpose, in the first part of the study, the definition, purpose and scope of the audit are explained in detail, the function and importance of the audit and the types of auditors and auditors are explained. Within the scope of the theoretical framework of the study, the conceptual framework of independent audit and independent auditor will be discussed in the second part. Again, in this section, the independent audit process with independent audit institutions in the legal framework is mentioned. In the third part of the study, the place and future of the certified public accountant profession in independent auditing has been discussed and content analysis has been made in this sense.

Keywords: Independent Audit, Internal Audit, Certified Public Accountant, KGK

1. Introduction

In recent years, along with the rapid growth of societies, many changes have occurred in terms of the economy. Especially in the period after the industrial revolution, the development of technology, capital increase, and the need for more investments caused the development and organization of capital markets and the development of new investment activities. As a result, it has revealed the necessity of auditing company activities to protect the rights and interests of information users related to the business. Financial resources in a country are generally under the control of businesses (Keskin, 2018: 12). In Turkish law, the auditing of the enterprises was carried out by public sector experts until 1987 to protect the public revenues with the tax legislation and the Commercial Code. As of 1987, independent auditors have been used as well as public auditors and independent auditing has started to take place in the auditing of enterprises (Akdoğan and Tenker, 2007: 12; Selimoğlu and Göktepe, 2007: 21). The implementation of audit supervision of banks in Turkey began with the first in 1987. The principles and rules regarding auditing have been legalized with the communiqués published by the Capital Markets Board in 1988 (Kutukız and Öncü, 2009: 21). An independent audit is an audit to determine whether the financial statements and other financial information comply with the generally accepted accounting standards and financial reporting standards by independent persons and to determine whether the financial statements reflect the truth. A certified public accountant is a person responsible for examining the tax-related transactions regarding the financial, economic, and legal situations of the enterprises, taking into account the accounting rules, facts, and compliance with the law (Karapınar, 2018: 67). When necessary, they can share their opinions impartially with those concerned. These persons are also authorized to certify the accuracy and reliability of the financial statements of companies. In the process in which sworn financial advisors work, they proceed in the form of

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collecting, processing, and evaluating evidence and information, reaching an audit opinion according to the evaluation results and transmitting this opinion to the relevant places with the approval report, and ultimately reach planned, meaningful and scientific information and decide accordingly (Ayotuz, 2016: 54)

2. Conceptual Framework of the Audit

The concept of auditing appears as a term that is frequently used in daily life both in the field of social sciences and in the field of engineering sciences. When we look at the equivalence of the concept of auditing in the dictionary, it is defined as "checking, inspecting and auditing whether a certain job is done correctly and in accordance with the management" (Güredin, 2010: 14).Financial audits (including taxation, wrong selling, and other forms of fraud), audits to misrepresent financial information have become a legal requirement for many organizations authorized to use financial information for personal gain. Traditionally, audits were associated primarily with obtaining information about financial systems and the financial records of a company or business. (Kishalı et al., 2013: 6-7).Financial audits are conducted to determine the validity and reliability of information and to provide an assessment of a system's internal control. As a result, a third party can provide an opinion on that person / organization / system (etc.). The opinion given on the financial statements will depend on the audit evidence obtained. A statutory audit is a legally required review of the accuracy of a company's or government's financial statements and records.The purpose of a statutory audit is to determine whether an organization provides a fair and accurate representation of its financial position by examining information such as bank balances, bookkeeping records and financial transactions.In most countries, supervision must comply with generally accepted standards set by governing bodies. These standards provide assurance to third parties or external users that they can rely on the auditor's opinion on the integrity of the financial statements or other matters on which the auditor expresses an opinion.Therefore, the audit should be precise and accurate, and should not contain any additional inaccuracies or errors. In recent years, with the rapid growth of societies, many changes have occurred in terms of economy. Especially in the period after the industrial revolution, the development of technology, capital increase and the need for more investments caused the development and organization of capital markets and the development of new investment activities. As a result, it has revealed the necessity of auditing company activities in order to protect the rights and interests of information users related to the business. Financial resources in a country are generally under the control of businesses. Accordingly, businesses have two functions regarding financial information (Köker, 2009: 81).

These;

a) Businesses can make choices regarding economic resources.

b) It is the ability to measure the success of economic resources in businesses (Kardeş et al., 2016: 134).

The existence of an effective control system is the basic building block required for the correct and complete maintenance of business activities. Thanks to the effective auditing system owned by the enterprises, the enterprises ensure that the financial statements are audited and the results are presented to the information users in order to reach their goals, long-term targets and reliable financial reports. The importance of auditing for institutions can be listed as follows: (Karacan and Uygun, 2012: 34).

a. Determination of internal and external hazards in businesses and elimination of possible damages are ensured by inspection.

b. It ensures that the conditions related to the inspection of the unit that has been assigned for inspection are made better and useful.

c. It is useful to carry out audits in order to eliminate the differences arising from implementation among the audited entities.

d. Effective decisions can be taken in the audit according to the result of the audit.

e. Some negative situations that occur in practice can be eliminated by the audit.

3. Audit types and Auditor Classification

Individuals who will perform the audit can be classified according to the relationship and position of the auditee, the activity of the audit, the subject to be carried out in the public or private sector, the subject to be audited, the area of application, the time period of the audit, the processes, the methods and techniques required and the approach adopted (Candan , 2012: 43). The purpose of auditing of financial statements is to reveal errors and frauds in these statements, to give more confidence to the users of the statements and to ensure the continuity of the enterprise by guaranteeing its

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financial status. (Karacan and Uygun, 2012: 34). The purpose of compliance auditing is to evaluate whether certain persons or organizations are acting in accordance with the rules and procedures determined by the business management or the authority affiliated to a regulatory body (Porter et al., 2009: 65). Activity audit is an audit that is carried out to understand the effectiveness of the activity flow in the enterprises and has a wide scope. The types of control according to the situation; It can be examined under two headings as "statutory audit" and "optional audit". Statutory Audit Compulsory auditing includes obligations about the legal audits of businesses or organizations that are subject to auditing (Weekci and Badem, 2011: 12). On-Demand Audit is the audits performed to reveal the facts about the current situation of the business even though there is no legal obligation to the relevant persons in the business (Türedi, 2012: 28). The separation according to the audit status varies according to the relationship between the auditor and the institution they will audit. These; It can be examined under three headings, namely "internal audit", "independent audit" and "public audit". The auditor can perform audit-related activities, act independently, have sufficient professional knowledge and experience, have the moral qualifications required for his profession, and work. They are people who show sufficient care and attention (Bozkurt, 2012: 31). Looking at the types of auditors; auditors can be grouped into four groups: Definition of the independent auditor in the independent audit regulation; The work carried out according to the scope of the TDSs authorized by the KGK is defined as the person or persons who have nothing to do with the business they serve according to an audit contract, and prepare a report by concluding the audit work they have carried out (KGK, 2012, Art. Individuals called independent auditors can work independently to continue their self-employment activities such as doctors and lawyers (Güredin, 2007: 45). The duty of independent auditors is to audit the reports obtained from the financial information of the companies. From this point of view, the opinion of the auditor increases the confidence in the financial statements (Karacan and Uygun 2012: 34). Financial statement auditors and non-financial information (including compliance auditing) can be divided into several categories: The external auditor / statutory auditor is an independent firm appointed by the audited client to express an opinion on whether the company's financial statements are materially misstated due to fraud or error. • Cost auditor / Legal cost auditor is an independent firm hired by the client who is subject to cost auditing to provide an opinion on whether there are material inaccuracies in the company's cost tables and cost schedule due to fraud or error. • State Auditors examine the financial situation and practices of government agencies • Secretariat auditor / Statutory secretariat auditor, secretariat to express an opinion that the company's secretarial records and compliance with applicable laws are free from material misrepresentation, and independent client appointed by the client, subject to an audit of compliance with applicable laws / other laws. is a firm (Türedi et al., 2014: 152).

An external auditor audits the financial statements of a company, government agency, other legal entity or organization in accordance with certain laws or rules and is independent of the audited entity. Users of these organizations' financial information, such as investors, government agencies, and the general public, rely on the external auditor to provide an impartial and independent audit report. (Weekly and Badem, 2011: 1; Acar, 2016: 65).

There are three main ways in which the auditor's independence can manifest itself.

a. Programming independence
b. Investigator independence
c. Reporting independence

Programming independence fundamentally preserves the auditor's ability to choose the most appropriate strategy when conducting an audit. Auditors should be free to approach a business in the way they think is best. Reporting independence preserves the ability of auditors to choose to disclose any information they believe should be disclosed. Independence has two important aspects to be distinguished from each other: independence in reality (true independence) and independence in appearance (perceived independence). Both forms are necessary together to achieve the goals of independence. True independence refers to the independence of the inspector, also known as mind independence.

Internal audit is an independent, objective assurance and consulting activity designed to add value and improve an organization's operations (Hacırüstemoğlu et al., 2001: 21). He strongly encouraged to look beyond financial statements and financial-related auditing in areas such as purchasing, storage and distribution, human resources, information technology, facilities management, customer service, field operations, and program management. This approach helped move the chief audit executive into a respected and knowledgeable consultant role considered to be reasonable, impartial, and concerned about helping the organization achieve its stated goals. (Kishalı et al., 2013: 6-7).

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Required corporate independence from management ensures unlimited evaluation of management activities and personnel, and allows internal auditors to perform their duties effectively. Although internal auditors are part of the company's management and are paid by the company, the primary client of the internal audit activity is the body responsible for the oversight of management's activities. This is the audit committee, typically a subcommittee of the board. Organizational independence is effectively achieved when the chief audit executive reports to the board functionally. Examples of functional reporting to the board include:

a. Approval of the internal audit charter;

b. Approving the risk-based internal audit plan;

c. Approving the internal audit budget and resource plan;

d. To get information from the chief audit executive about the internal audit activity's plan and performance regarding other issues;

e. Approving decisions regarding the appointment and dismissal of the chief audit executive;

f. Approving the chief audit executive's remuneration;

g. Conducting appropriate investigations with management and chief audit executive to determine whether there are inappropriate scope or resource constraints.

Management is responsible for internal control, which consists of five critical components: the control environment; risk assessment; risk-oriented control activities; information and communication; and monitoring activities. Managers establish policies, processes and practices in these five components of management control to help the organization achieve the four specific objectives listed above. Internal auditors perform audits to assess whether the five components of management control are present and functioning effectively, and if not, make recommendations for improvement.Internal audit professional standards require the function to evaluate the effectiveness of the organization's Risk management activities. Risk management is the process by which an organization identifies, analyzes, responds, collects and tracks information about strategic risks that may actually or potentially affect the organization's ability to achieve its mission and objectives.Internal audit activity related to corporate governance has generally been informal in the past and is carried out primarily through participation in meetings and discussions with board members. According to COSO's ERM framework, governance is the policies, processes and structures used by the organization's leadership to direct operations, achieve goals, and protect the interests of various stakeholder groups in a consistent manner with ethical standards. The internal auditor is generally considered to be one of the "four pillars" of corporate governance, with the other pillars being the board, management and external auditor.

4. Certified Financial Colsultancy

Unlike the practices applied in other countries in Turkey and non-literal application of chartered accountant profession is a profession unique to our country (Turkey, 1995). YMMs cannot perform activities such as bookkeeping, opening accounting offices or partnering with accounting offices within the scope of accounting transactions (Bezirci and Karasioğlu, 2011: 579)When evaluated within the framework of Law No. 3568 and regulations, the duties of YMM's; It takes place as audit, certification and consultancy. As far as the practices in Turkey rises to certify the foreground tasks between these tasks. When evaluated in a general framework; It is also possible to state that audit duties are carried out as part of the certification process. Tax audits are taken as basis in these audits that YMMs carry out due to their certification procedures. Consultancy is a complement of these duties (Mert, 2014: 25) With the powers and duties given to members of the profession such as approval, audit and consultancy, reducing the burden of the state in tax auditing, preventing corruption in the tax system, ensuring efficiency in tax collection, may arise due to tax legislation. It is aimed to provide efficiency in issues such as minimizing conflicts (Ertürk, 2007: 25-26). In addition, the basic duties of YMM in the draft law and commission report of the Law No. 3568; To investigate whether the balance sheet of the company is reflected in a true and correct manner in accordance with the accounting procedures, to examine the profit and loss statement in order to determine that the income and expenses of the accounting period are correctly arranged according to the accounting records.

5. The Role and Future of Certified Public Accountant Profession in Independent Auditing

An independent audit is an audit to determine whether the financial statements and other financial information comply with the generally accepted accounting standards and financial reporting standards by independent persons, and to determine whether the financial statements reflect the truth.

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regulations concerning the historical development of auditing in Turkey can be summarized as follows (Eyyüpgil and İlseven, 2016: 135-137);

a. Publishing the Independent Audit Communiqué in 1987 for the purpose of surveillance for banks,

b. Afterwards, publishing of various independent audit communiqués of the Capital Markets Board (CMB) in 1987-1988,

c. Beginning of the implementation of CMB Series XI Accounting Standards Communiqués as of 1989,

d. Establishing audit committees with the Banking Law No. 5411,

e. Establishment of the Banking Regulation and Supervision Board (BRSA),

f. 2499 laying Market Act with Turkey and Turkey Accounting Standards Board's Auditing Standards Board of the creation,

g. Turkey since 2006. Starting from 2013, the Financial Reporting Standards issued by the Auditing Standards of Turkey,

h. It can be summarized as the publication of the Turkish Commercial Code numbered 6102 in 2011.

Considering these developments; Published on 31.03.2006 and International Financial Reporting Standards (IFRS) 's full translation, which is being issued in Turkey Financial Reporting Standards, Turkey Establishment of Audit Standards, to be released establishment of the Institute of Public Oversight in 2011 and 6102 of the Turkish Commercial Code, the most comprehensive in terms of audit and are considered as important regulations.

When the laws related to sworn financial advisors are examined, those who carry out the procedures in the certification process together with the conditions and authorizations required for "Independent Accountant Financial Advisors" are called sworn financial advisors. Certified public accountant, on the condition that the responsibilities arising as a result of the contract, which have the qualifications specified in accordance with the laws, who have to fulfill the transactions within the target and scope, within the specified period, are included in the contract; are persons who are legally obliged to evaluate the contract in line with the target and scope.

However, the responsibility to protect the benefits of the taxpayer. Taxpayers, whose responsibility is fundamental to the professional effort required in their work in the transaction process. and those who are obliged to execute the interests between the government in a balanced manner, to prepare a required report within the specified period of time, without error. chartered financial consultant before the Law No. 3568 legalized in Turkey, everyone who wants to can keep records and documents without the need to enter any examination and was able to consultancy. Although many bills were submitted to the Turkish Grand National Assembly to legalize this situation, there was no development in this regard until 1989. Later, with the enactment of the law, the "Free Accountant, Certified Public Accountant and Certified Public Accountant Law No. 3568" entered into force in 1989. With the aforementioned law published in the "Official Gazette No. 20194", the profession of chartered accountant, which was established to declare the taxable income affecting the economic and social life of the society, emerged. According to the article 2b of the law numbered 3568;

a. "Establishing and developing accounting systems, organizing or consulting on business, accounting, finance, financial legislation and their applications".

b. "To examine, analyze, audit, give written opinion on issues related to financial statements and declarations, arrange reports and the like, arbitration, expert witness and similar works on the subjects written in the above paragraph, based on their documents".

c. "In addition to these, to carry out the approval procedures within the framework of the Regulation on Documents to be Approved by YMMs issued according to the 12th article of the Law, Subjects of Approval, Procedures and Principles Regarding Approval" constitutes the duty definition of sworn financial advisors. Certified public accountants can perform the duties specified in the first two paragraphs of the above articles together with Certified Public Accountants (SMMM). Only duty related to the approval mentioned in the last article can be carried out by sworn financial advisors. In addition, sworn financial advisors are prohibited from keeping books outside of their official records, opening accounting offices or being partners in such offices. In this regard, the subject of the sworn financial advisory profession is to certify that the financial statements and declarations of taxpayers comply with the provisions of the legislation, accounting principles and accounting standards, that their accounts are examined in line with the auditing standards, and to fulfill the duties assigned by the Ministry of Finance and official parties. Certified public accountant is the person responsible for examining the tax-related transactions regarding the financial, economic and legal status of businesses, taking into account accounting rules, facts and compliance with the law. When necessary, they can share their opinions impartially with those concerned. These persons are also authorized to certify the accuracy

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and reliability of the financial statements of companies. In the process in which sworn financial advisors work, they proceed in the form of collecting, processing and evaluating evidence and information, reaching an audit opinion according to the evaluation results and transmitting this opinion to the relevant places with the approval report, and ultimately reach planned, meaningful and scientific information and decide accordingly (Ayotuz, 2016: 53). Certified public accountants reduce the burden of the tax office by undertaking the time-consuming audit and inspection tasks of the highly complex tax office.

d. Thus, the scope of inspection and inspection is expanded and at the same time efficiency in tax inspection is ensured. In addition to these duties, it is among the duties of sworn financial advisors to provide the declaration of the real income of taxpayers. Since the mistakes made by the taxpayers must be corrected immediately, the certified public accountants have to carry out the tax audit and the accounting audit together. If situations contrary to the tax legislation are detected, the taxpayer is asked to correct the situation; If they are not corrected by the taxpayers, together with these contradictions, during the counter-examination, the issues that are against the tax legislation, which are determined in relation to the taxpayers who are subject to tax inspection, are also stated in the certification reports (Külahi et al., 2013: 31).

e. In addition, certified public accountants carry out "counter-examination" regarding the authenticity of the documents and invoices used in the approvals for full certification and value added tax return, and the fact that the VAT shown in the said documents is deposited at the tax offices. Sworn financial advisors are also obliged to carry out a research study showing that any good and the VAT shown on the invoice of these goods are deposited to the tax offices. For this reason, it is mandatory that the invoice company is informed by the certified public accountant; Over time, the tax and administrative courts have stated that sworn financial advisors are not obliged to provide such information. In this context, sworn financial advisors did not have to take responsibility by investigating whether the invoices received by their taxpayers were real and that the goods in question entered the business (Erol and Çetinkaya, 2000: 234).Certified public accountant is important in understanding taxable income and helping tax management. In this context, a certified public accountant and accountant show some similarities, but certain points should be explained in order not to confuse the two professions. An accountant cannot do all the work of a certified public accountant, but a chartered accountant can do all the work of an accountant. In addition to all these, they also provide certified public accountants, exact calculations, reporting and audit services. A person must pass many trainings and exams in order to become a certified public accountant; However, it must have certain licenses.In the light of this information, certified public accountants who are professional consultants should also be independent and objective. The service that a certified public accountant provides to his clients is much more than an accountant thanks to the knowledge and experience he has.

6. CONCLUSION AND RECOMMENDATIONS

In Turkish law, the auditing of the enterprises was carried out by public sector experts until 1987 in order to protect the public revenues with the tax legislation and the Commercial Code. Since 1987, independent auditors have been used as well as public auditors and independent auditing has started to take place in the auditing of enterprises. The implementation of audit supervision of banks in Turkey began with the first in 1987. Principles and rules regarding auditing have been legalized with the communiqués published by the Capital Markets Board in 1988.The CMB was established in 1981 in order to enable the public to take a role in economic development by utilizing savings (investing in securities), to increase the transparency of the capital market and to protect the rights and interests of the savers. the control system after the 2001 crisis in Turkey, the Capital Markets Board (CMB) began to create. The Turkish Commercial Code adopted in 6102 on 14 February 2011 shed light on the development of independent auditing in Turkey and today can be considered the most important regulations that lead to independent auditing practices.Establishing the UPS; Turkey has a control area in the various institutions having the authority to eliminate the fragmentation that occurs as a result of making different arrangements regarding their field of duty and of great importance in terms of creating a holistic legal structures in an audit. And also; To gain international validity to financial statements, to combat the informal economy, to contribute to the creation of a stronger and transparent capital market, to increase the competitiveness of companies, to comply with the European Union acquis, and to produce solutions to problems encountered in practice by following international developments are among the aims of KGK's establishment. (General Justification of Decree No. 660).While determining the auditing standards of the POA, it is based on the International Auditing Standards (ISA) adopted by the International Federation of Accountants (IFAC). International Standards on Auditing in studies related to the audit imposed by Turkey is the main source. UPS and published by Turkey which are compatible with International Standards on Auditing Independent Auditing Standards are presented in summary form in the following manner.

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Internet of Things and Smart Cities: A Bibliometric Analysis

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Abstract

For several years, the 21st century has seen a global shift toward concentrated population in a select few metropolitan cities. However, being a larger and more crowded city has certain advantages, such as being more productive, innovative, and taking progressive environmental action. Additionally, major cities present many positives, such as development, traffic congestion, garbage management, access to resources, and negatives, such as unregulated growth, worsened traffic, garbage collection issues, and limits on resources. Conversely, the global economy has increased connectivity between cities worldwide in hitherto unseen ways of competitiveness. Experiments in urban infrastructure and services, usually referred to as Smart Cities, are related to difficulties. A number of these methods could be used in the future to address new information technology jobs. The smart city concept revolves around organizational structures and urban life in a new form that is expected to shift production and consumption from the global to the local, with business remaining with multi-stakeholder shareholders. One of the critical problems in these new cities is implementing information technology, especially the internet of things. Through a bibliometric examination of studies published in SCOPUS and Web of Science on the ideas of smart cities and the internet of things, this research uncovered some insights about the academic climate in the field. For example, the field's active actors (writers, institutions, and countries, for example) were identified, and their contributions were attempted to be exposed. Among the research findings is a content analysis of terms used in related studies and the evolution and interplay of concepts across time. This study has presented an overview of the field and several predictions about the possible directions it will go in the future.

Keywords: Smart City, Internet of Things, Bibliometric Analysis

1. Introduction

Cities' populations are predicted to have doubled by the year 2050, according to WHO projections. Cities, huge and growing ones, face more complex difficulties such as providing transportation, managing expansion, and managing population increases. This concept, known as the "Smart City," seeks to cope with all of these issues by relying on information and communication technology to make the city itself, as well as all of its structures, communications channels, and other equipment, as smart as possible (Gheisari et al., 2020:3).

Cities are a creative source of invention and ecosystems where players with various interests are given space to interact to support long-term sustainability and prosperity. Cities served by education, technology, and innovation result from ethereal and tangible forces acting together (e.g., institutions and digital infrastructure). ICT infrastructure combined with human capital, social capital, and economic development results in sustainability and higher quality of life (Macke et al., 2018:718).

Today, cities must address several global issues, such as economic growth, financial stability, job development, environmental sustainability, etc. For these kinds of difficulties, the Internet has emerged as a critical component in the long-term strategy. The value of IoT and the difficulties faced by cities both play a role in fueling increased interest in digital urbanism among architects, transportation, and public organizations. The core IoT architecture empowers cities to bring groundbreaking urban ideas to life while adapting to changing user needs. We can help optimize IoT architectures using leading technologies, software-defined network services, and virtualization. The architecture of the Internet of Things (IoT) is highly recommended for smart city initiatives (Ahmed & Rani, 2018:942).

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The use of digital technology to improve city life is key to making cities smarter. Reforming critical services such as housing, education, health, transport, energy, water, utilities, surveillance, and law enforcement is one of the critical goals of smart cities. Cities that promote social, commercial, and physical infrastructure that reduce population growth and urbanization are considered intelligent cities (Majeed et al., 2021:1).

There are not many cities in the developed world with modern infrastructure while also providing up-to-date digital services for their inhabitants. They are referred to as "smart cities" since all of their modern amenities and infrastructure are built on IT systems. Information and Communication Technology (ICT) has changed the urban environment dramatically in recent years (ICT). As a result of providing e-governance-related services to city people while also developing the city's economy, these cities also increase their intelligence (Chatterjee & Kar, 2018:190).

We are all being connected via the Internet of Things (IoT). This digital world fosters the emergence of creative applications that apply Internet technology to construct intelligent communities. In today's society, the rise of internet technologies such as cloud computing, the Internet of Things, and mobile technology has caught the attention of city planners, who are trying to build sustainable ecosystems (Sharma et al., 2020:3).

The wide availability of new technologies and services as facilitators and value carriers in smart city implementations, especially from a ubiquitous and pervasive perspective, is encouraging. Real-time processing and reliable, high-quality services in various application areas, including robots, crewless vehicles, and drones, are enabled by 5G networks with unpredictable capabilities. Real-time sentiment analysis and opinion mining can be applied to extensive distributed systems through data mining techniques. The new cyber-physical systems designed to integrate the physical and virtual worlds are part of the IoT. In addition to virtual and augmented reality and advanced image processing technologies, this next revolution in human-computer interaction utilizes virtual and augmented reality and advanced image processing technologies (Lytras et al., 2021:3).

There have been substantial changes in our lives due to Internet of Things (IoT) applications. Everyday things have sensors, wireless networks, and new computing capabilities integrated into them now. Because of this, we have seen the rise of smart devices, home automation systems, medical care applications, "smart cities," and industrial automation. For the past few years, IoT has lingered in the background of business, but it appears to be ready to emerge into the forefront. A physical device's processing and networking capabilities are used to collect information in bulk in real-time due to the Internet of Things (Sestino et al., 2020:1).

Industrial systems already in place, like transportation, energy, and manufacturing, are likely to transform due to the IoT. Tightly interconnected Internet of Things (IoT) gadgets are vital components of a smart city, and their usage is becoming increasingly ubiquitous in day-to-day life. The IoT can help households and businesses use less energy, help the environment, help consumers, and lead more sustainable lifestyles. Websites, mobile applications, wearables, connected appliances, and more all employ internet-based information design to communicate data, information, and services linked to a network. Cities are transitioning towards a vehicle-integrated, connected, and intelligent living area, which is projected to rely heavily on IoT, mobile technologies, and next-generation networks (Janssen et al., 2019: 1590).

In the development of smart cities, the Internet of Things (IoT) is of extreme importance. In particular, it is beneficial to the city's industrial and commercial development and those industries that take place in the city's central area. In a broad sense, the successful implementation of IoT technology is crucial for the city's industrial restructuring. It encompasses central resource usage and smart city optimization (Zhang, 2020: 631).

2. Theoretical Framework

2.1. Internet of Things

Internet infrastructure will be a key player in connecting physical items, thanks to using the Internet as a worldwide platform. One of the essential components of creating new and novel innovation will be the utilization of electronics embedded in things and harnessed inside the fabric of our world (Khajenasiri et al., 2017:770).
The notion of IoT was developed by Kelvin Ashton in 1999 when he coined the term Internet of Things (IoT). A platform is created by connecting internet-enabled objects to enable particular activities. The device uses the network

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and everything connected to it to accomplish any function. One idea is to make nearby items speak to one other over the Internet. The system is completed by utilizing in-built wireless connectivity to connect everyone and everything at any time and wherever. It can be a helpful connection with the rest of the environment because it simplifies monitoring and controlling the environmental aspects via the Internet (Gamil et al., 2020:1092). IoT makes an object able to perceive by hearing, seeing, listening and communicating all at once. It will no longer be viewed as a computer network by the Internet. The billion-device combination will also comprise smart gadgets and embedded systems. The IoT will dramatically develop in size and scope, bringing new opportunities and increasing the number of problems (Rathore et al., 2016:64).

IoT, or the Internet of Things, has been enabled by new software, hardware, and communication technologies. IoT is a network of interconnected and associated physical devices that collect, transport, and share data (Ma et al., 2020:165). A young technology utilizes networked sensing and communication to bring out automated devices, machinery, sensors, and actuators (Qureshi et al., 2020:1). IoT is the Internet of Things, in which everyday objects connect. The Internet is still the cornerstone of IoT, but in this instance, communication and object interaction is of vital importance. Ultimately, information communication aims to satisfy the basic requirements of human beings (Liu et al., 2020:326).

Connectivity is provided, but real-time intelligent control of things is also possible due to the IoT. A significant number of sensors are placed on the IoT, which means IoT can collect a great deal of data. Each sensor provides data. There are a wide variety of sensors, which provide varying information content and formats of information. Real-time sensor data and environmental information are both gathered regularly, and the data is updated regularly. Intelligent technologies, such as cloud computing and pattern recognition, extend the application possibilities for IoT. The sensor can collect an incredible amount of data through this method, which is then studied and processed (Huang, 2020:284).

By connecting various sensor-based devices, IoT is better able to collect data more conveniently. The innovative way to tackle complex sensing applications like telemedicine systems, intelligent traffic management systems, and environmental monitoring systems is an example of what is meant by practical use of computer technology. Real-time data can be obtained by placing a large number of sensor-based devices in a significant quantity. The amount of data acquired from sensors increases geometrically as the number of sensors grows. Nonetheless, enormous amounts of data are not sufficient on their own. The concept of Smart Data came to be as a result. Intelligent IoT serves a wide range of use cases for making intelligent decisions (Teng et al., 2019:351).

As with other IoT systems, cloud computing solutions are critical to IoT. Users gain the capacity to view information remotely by using the internet cloud services. Large amounts of data can be collected in the cloud and processed using cloud-based apps due to interactions between the cloud and sensors (Bogatinoska et al., 2016:707). A great deal of AI research has advanced significantly in the last few years. There are various fields in which AI technologies are applied. Examples include identification, communication, and the application of Internet of Things (IoT) machine learning algorithms, such as deep learning, neural networks, and big data (Ma et al., 2020:168).

The rapid proliferation of IoT technology boosts cyber-attacks daily. Developing IoT creates new problems. The IoT network should also be monitored to defend it against cyberattacks. However, cybersecurity solutions have become more commonplace in the IoT environment in recent years. Researchers have been developing these systems and frequently using them to safeguard sensitive information and computer systems from illegal access. Similarly, identifying anomalies and intrusions in an IoT network environment is a daunting task, and academics are constantly working to combat this challenge (Shafiq et al., 2020:433).

2.2. Smart Cities

Citizens, buildings, transportation systems, grid systems, industries, education, and health services all go through a change process during the notion of smart cities. The implementation of smart technology was used to implement monitoring, control, recognition, and understanding to boost efficiency, impartiality, and economic growth while also improving the quality of life. Urbanized areas are referred to as "smart cities" because they possess a wide array of advanced technologies supporting the network and providing data services. The primary goal of this approach is to help people, reduce the cost of their products, and increase their economy. The Smart City digital systems and environments can be utilized for smart city applications, including efficient municipal operations and data transfer. People's systems have evolved into the digital age due to these new technologies (Qureshi et al., 2020:2).

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A smart city depends on applying ICT in tandem with human capital to provide sustainable economic development and resource management while increasing the quality of life for people. City models are also a great city model because they improve citizens' and society's relationships. These models are focused on maintaining and growing those relationships (Pinochet et al., 2019:75). Citizens will benefit from smarter cities since they will enjoy a higher quality of life and access more services. To properly design and administer these services, the input of individuals must be given due consideration (Yeh, 2017:556).

A city that employs information and communication technologies (ICT) and other instruments to raise the quality of life, efficiency, and competitiveness while helping to meet the requirements of future generations is defined as a smart and sustainable city by the International Telecommunication Union (Angelidou et al., 2018:151). We might alternatively define the smart city as an approach that integrates a wide range of services for particular needs, develops collective skills and abilities, and fosters overall well-being. Because of this, it provides access to government agencies, schools, businesses, residents, health, and social services for all communities (Roy, 2001:7). Sustainable, innovative, holistic, and connected cities feature Information and Communications Technologies (ICT) solutions alongside sustainability, overall technical performance, economic feasibility, and stakeholder input (Sharma et al., 2020:1).

This development is ever-changing and ever developing. The city development arm will be honored with the nation's advancement. Beginning as traditional development, the process shifts to a smart development process dedicated to rational resource utilization and environmental quality improvement (Zhang, 2020:632). The smart city prioritizes the people who live there and their requirements. One of its policies is to work with and via community and stakeholders to get the community involved in making choices and administering public services to express their demands better. The objective is to make the services citizens demand available, create a climate that invites involvement, and interface with public and private entities (Pinochet et al., 2019:76).

Urban development difficulties can be solved using the smart city as a valuable instrument. It can collect comprehensive and thorough information and send forth relevant and valuable information to the desired audience. This strategy can help with urban management and operational efficiency, and it also aids in improving the delivery of urban services. Cities are smart enough to create new forms of urban development independently, which means the public can experience the city's wisdom offered through the city's intelligence services and applications (Prakash, 2019:158).

Due to the fast growth of cities, modern cities are struggling with management efficiency and urban quality of life difficulties. There seem to be many possible answers to these and other current difficulties in urban areas due to smart city technologies. A modern city is functionalized to ensure sustainability and efficiency while at the same time keeping the design appealing. Achieving this goal can be done by combining numerous infrastructures and services into units equipped with smart devices to be monitored and managed. Smart cities focus on urgent and routine concerns, like crime management, education, energy, environment, health, public transport, employment, and trash management (Alavi et al., 2018:590). While a smart city can be defined as a city center with technologies that utilize digital data for improved public services and resource management, a smart city can also be viewed as a city center whose capabilities are enhanced by digital data and technology. Smart city, smart management, smart economy, smart residents, smart mobility, smart environment, and smart lifestyle are critical parts of the smart society concept (Alavi et al., 2018:591).

In solving the problem of real-time management of urban flows, smart city applications are being created. This century has seen an upsurge in demand for smart cities due to technological, economic, and environmental advancements. As a result of these changes, which include climate change, economic restructuring, an aging population, and financial pressure, these elements must be factored in. The smart city, house, grid, automobile, and traffic management are examples of other applications that might be considered applications that operate under the smart city concept (Khajenasiri et al., 2017:771).

A more intelligent means of public transportation improves the quality and efficiency of public transit. This process comprises systems that collect and disseminate information, including technology from smart cities that help reduce automobile dependency and increase sustainability. In a smart city, various smart city technologies draw attention to the automated driverless guided car. A guided vehicle that uses radio waves, cameras to assist navigation has been created. Autonomous processes remove human interference when parking is provided for vehicles in a smart city (AlZubi et al., 2021:1). A smart parking system is essential for parking lot management in highly populated places, such as retail

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centers, arenas, and other prominent monuments. Sophisticated parking solutions address regular parking space distribution by working to lower the demand for parking. The Intelligent Parking System helps increase productivity, safety, and versatility, lowers parking fees and prevents vehicle jams. To ensure the security of auto parking facilities, a parking system to encourage parking has been established, implemented, and tested to oversee and manage the opening of parking facilities. It is a more accessible and more straightforward alternative to others. Thus it is necessary. The primary purpose of this project is to develop ways to reduce the amount of time needed to find a parking space. The proposed technique connected with this is to constantly monitor parking space vacancy; (Bedi et al., 2021:1).

To control the intensity and passage of streetlights, the smart street lighting system uses various sensors and controls. Light switches turn on as it becomes dark, and vehicles and pedestrians use a nearby light pole to cross the street. When it gets light, the streetlight automatically goes off. This intelligent street lighting system features a remote control that allows users to turn on and off streetlights, automatically dims headlights, diagnoses and isolates issues, detects theft, and collects data. The intelligent streetlight employs an infrared sensor to track vehicle movement and then operates the light when it is unnecessary to consume electricity, reducing energy consumption (Anguraj et al., 2021:2).

The essential issue to solve is providing an avenue for maintaining data security, privacy, and complete transparency across many channels. A blockchain can record many transactions that are characteristic of smart cities. Using smart contracts, people can conduct complex legal operations and exchange data automatically. By using smart contracts and decentralized apps, blockchain gives cities greater control of their operational processes, making cities more autonomous. A lot of new applications and services can be built on top of blockchain technology. A tremendous amount of effort has been devoted to exploring how blockchain applications will be used in smart cities (Majeed et al., 2021:2).

Permanent preservation of the digital records of city residents on the cloud is one of the significant benefits of smart cities. Though in many cases it takes the system less time to complete a task with the use of various digital service modes, such as speedier, paperless, seamless, etc., it is beneficial to overall system efficiency and possibly quality of life (Chatterjee & Kar, 2018:192).

2.3. Internet of Things in Smart Cities

Cities will become more economically, environmentally, and socially due to urbanization and competition. Cities are increasingly using the semantic web, cloud computing, gadgets, and emerging ICTs to create and plan local places. In terms of new technologies and sensors, the concept of IoT (which stands for "the Internet of Things") suggests integrating the virtual world of IT with the actual world (Bresciani et al., 2018:332).

Different technologies, such as Big Data, Cloud Computing, and the Internet of Things, are available in smart cities. While it is true that being "technical" is not synonymous with being "intellectual," we must emphasize that it is essential to be a well-informed and tech-savvy individual. An integrated system connected to the city's clean-up center will need a waste collector to be "smart." For these cases, it has been found that when there is a dialogue between technologies, the smart aspect appears. The data scientists aim to predict tiny factors in significant outcomes with a greater emphasis on nonlinear computations; for example, the ability to forecast environmental calamities with the aid of artificial intelligence, machine learning, and deep learning (Pinochet et al., 2019:74).

A smart city collects data using sensors and sensor-based technology to provide better services using several IoT applications. Many villages, cities, and municipal governments are currently looking to implement smart city technology as the next step in e-governance, which helps the public interact with city hall in new ways or streamlines existing ordinances. A new step has been reached in modern factory information development with the introduction of the smart factory. Using IoT and equipment monitoring technologies, smart factories and digital factories use the collected data to manage information, provide services, produce more, promote sales, raise manufacturing control, and minimize labor interventions in the production line (Zhang et al., 2020:574). When it comes to sustainable and smart city infrastructure, including the Industrial Internet of Things, IoT technology is also involved (IIoT). In the IIoT, industrial devices are designed to do all three things: manufacturing, operating, and maintaining industries. Smart cities also use smart technology to boost traditional industries' manufacturing and operational capacities (Qureshi et al., 2020:1).

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As a meditation on the city's expansion to incorporate several ICT and IoT solutions to manage city resources better, smart cities and society are intertwined. It enhances the quality of life for inhabitants and provides high-quality services. Such things as surveillance, health, water, utility, business, parking, and the environment are included in the services. The fundamental objective of smart cities is to make sure traditional city services perform effectively (Babar et al., 2021:1). The IoT system plays an essential part in the creation of the smart city. Instead of placing sensors all over the place and connecting them to the Internet, IoT systems utilize sophisticated sensor networks to identify, locate, monitor, and intelligently manage points. Numerous significant challenges crop up while designing IoT systems for smart cities due to the vast size of cities (Teng et al., 2021: 310). In order to accommodate the current and future technological needs of the citizens, the smart city is built on top of modern information technologies, such as artificial intelligence, intelligent control software, expert decision-making technology, and sensing equipment. The information-sharing network system employs artificial intelligence to realize the sharing of information, resources, and tasks, and all operational intelligence of the city is then present. Cities can be described as 'smarter' because of IoT. IoT apps serve as the vehicle for realizing intelligent cities, the "goal" for which they are developed (Huang, 2020:284).

It is critical to obtain physical location information for smart city IoT applications. In applications such as smart transportation systems and smart parking lots, incorrect car location estimates might endanger people. The sensor must anticipate its location in smart grids, environmental monitoring systems, and other applications. The inaccuracy of the position measurement might lead to substantial financial losses. The sensor network is also guided by the physical position information of the sensors (Teng et al., 2021: 311).

Smart cities are now possible thanks to the Internet of Things. A critical feature of a smart city is the use of intelligent technologies across multiple sectors, including housing, energy, wastewater, transportation, agriculture, environment, health, and government. More specifically, IoT is used in the following industrial areas: oil and gas mining, production units. IoT is associated with improved production, optimized costs, enhanced employee capabilities, more accurate prediction of equipment maintenance, and a great degree of human comfort (Raghuvanshi & Singh, 2020:1). With the IoT, people's lives, such as health, safety, and transportation, will be affected. At the national level, it is critical in crucial policy decisions like energy conservation, pollution reduction, and more (Janssen et al., 2019: 1591).

In an IoT architecture, the service layer refers to the applications and services needed to support smart cities. An analytics system that relies on the collection and dispersion of data seeks to generate insights that may be used for smart services. While the middleware layer comprises data and device integration technologies, the infrastructure layer focuses on devices situated in cities that use advanced technology. For example, light and weather-responsive bulbs for intelligent and real-time monitoring of noise are installed on the streets, while pollution sensors used for real-time monitoring of noise are located in central places (Alavi et al., 2018:594).

It is relatively common to consider waste management to be a connected IoT service. It is commonly connected to the application of intelligent transportation in smart cities. Because this Smart City solution is founded on intelligent transportation systems and waste collection, it uses surveillance systems, sensors, and cameras to create an even more advanced platform in smart cities (Bogatinoska et al., 2016:709).

3. Methodology

In this study, a bibliometric analysis was performed on 2289 papers on the Internet of Things (IoT) and smart cities published between 2011 and 2021 in the Web of Science Core Collection and SCOPUS. To analyze and illustrate the results, the Bibliometrics package (Aria & Cuccurullo, 2017) in the R software was utilized. Despite the wide variety of tools, which includes packages, that can be employed in the bibliometric analysis, packages including the majority of the required bibliometric analyses in R and the visualization success of these packages can sway one's decision to utilize them in this study. It was also employed in the burst detection analysis, which was accomplished using Jon Kleinberg's burst detection technique.

A substantial portion of the study's conclusions consists of spreading the data throughout the data set by years, nations, universities, and journals and creating a map of the keywords contained in the data set. Additionally, studies on citation levels by year, journal impact levels, and country citation levels are included in the study's conclusions.

3.1. Data Collection and Pre-processing

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The process of creating the data set logically consists of three stages. As a result of the literature review in the first stage, a database query was carried out with the keywords smart city and Internet of things. In this context, the query code performed to identify the articles written on related topics is as follows, and the query stages are shown in Table 2.

(TS=(("internet of things" OR "iot") AND "smart cit")) AND (TS=(("internet of things" OR "iot") AND "smart cit*")) NOT (TI = ("literature review" OR "bibliometric*") OR KP = ("literature review" OR "bibliometric*") OR AK = ("literature review" OR "bibliometric*"))) AND DOCUMENT TYPES: (Article)*

Table 1. Data Collecting Stages

Stage 1: database query: **Web of Science:** **Result: 1948 articles** **Scopus:** **Result: 2248 articles**	**Keywords:** **inclusion:** - internet of things - iot - smart cit* **exclusion** - literature review - bibliometric*
Stage 2: Combining results from both databases **Result: 2362 articles**	- Deleting duplicate studies and obtaining the original data set
Stage 3: Removal of studies with missing data from the data set **Result: 2288 articles**	Exclusion criterion: - No date information - No keywords

As a result of the query, 1948 articles were found in the WoS database, and 2248 articles in the Scopus database. Literature review and bibliometric analysis studies were excluded from the data set during the query. In the second stage, the results obtained from both databases were combined by eliminating the duplications. As a result of this phase, the number of articles was reduced to 2362. At the last stage, a data set consisting of 2288 articles was obtained by removing 74 publications that did not meet the necessary criteria for analysis.

The data set obtained in the data preprocessing stage was reviewed in detail and made ready for analysis. At this stage, some corrections were made regarding the keywords. For example, keywords such as "smart cities," "smart city," "smart city," "IOT," "internet of things," "internet of things technology" have been combined into a single keyword to express the concept. The words "internet of things," "iot," and "smart city," which were used during the creation of the publication pool, were excluded from the analysis. The purpose of removing these words is that they may overshadow other concepts in the analysis. Thus, it is aimed to focus directly on the concepts related to smart cities and Internet of things technology.

4. Findings

The bibliometric analysis carried out within the scope of this study includes publications between the years 2011: 2021. The data set consists of 2288 articles. Six thousand three hundred ninety-three authors wrote these articles. The number of single-author articles is 169, which shows that two or more authors wrote 6224 articles.

Table 2. Main Information About Publications

Timespan	2011:2021
Documents	2288
Authors	6393
Single-authored documents	169
Documents per Author	0.357
Authors per Document	2.79

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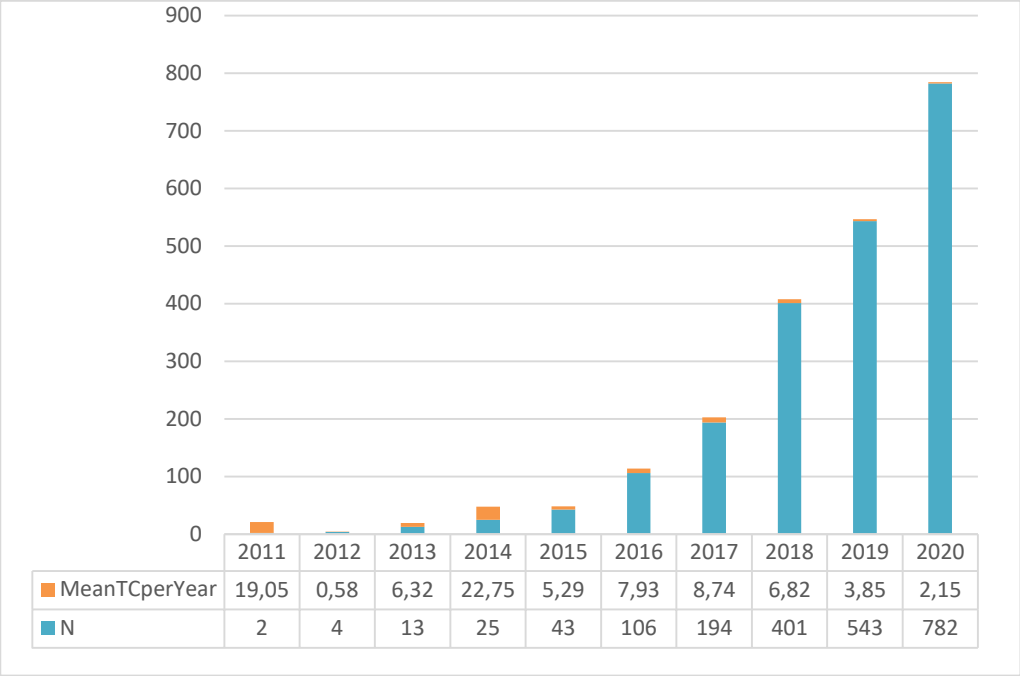
Co-Authors per Documents	4.01
Total Citations	31,493
Collaboration Index	2.94

In Graph 1, the distribution of the number of articles examining smart cities and the averages of citations by years is seen. The blue part of each column in the graph shows the number of publications in the relevant year, and the green part shows the average number of citations per article in that year. It has been observed that the number of articles and citations on the subject has increased since 2016. Although the oldest publications on the subject date back to 2011, the increase in publications after 2016 maybe because concepts such as industry 4.0, the Internet of things, etc., have started to be popular in academia since these years and started to be studied together with smart city processes.



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
MeanTCperYear	19,05	0,58	6,32	22,75	5,29	7,93	8,74	6,82	3,85	2,15
N	2	4	13	25	43	106	194	401	543	782

Graph 1. Annual Growth of The literature

4.1. Countries and Institutes

When country results are examined, it is seen that the publications originating in Italy are the most cited. Then it comes to China, USA, Spain, and England, respectively. However, when the number of publications is examined, Chinese authors come first, and US writers come second. This situation can be interpreted as Italy being more active academically.

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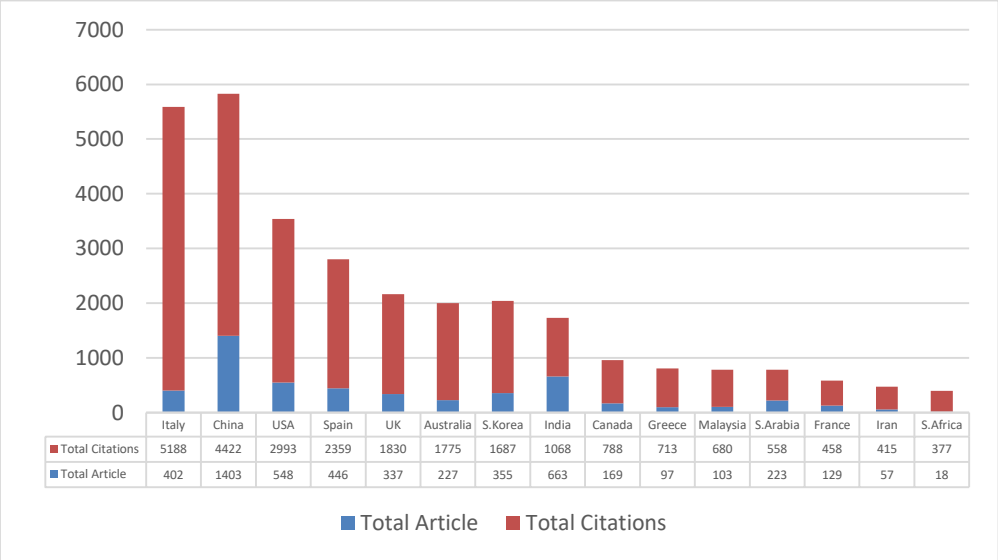
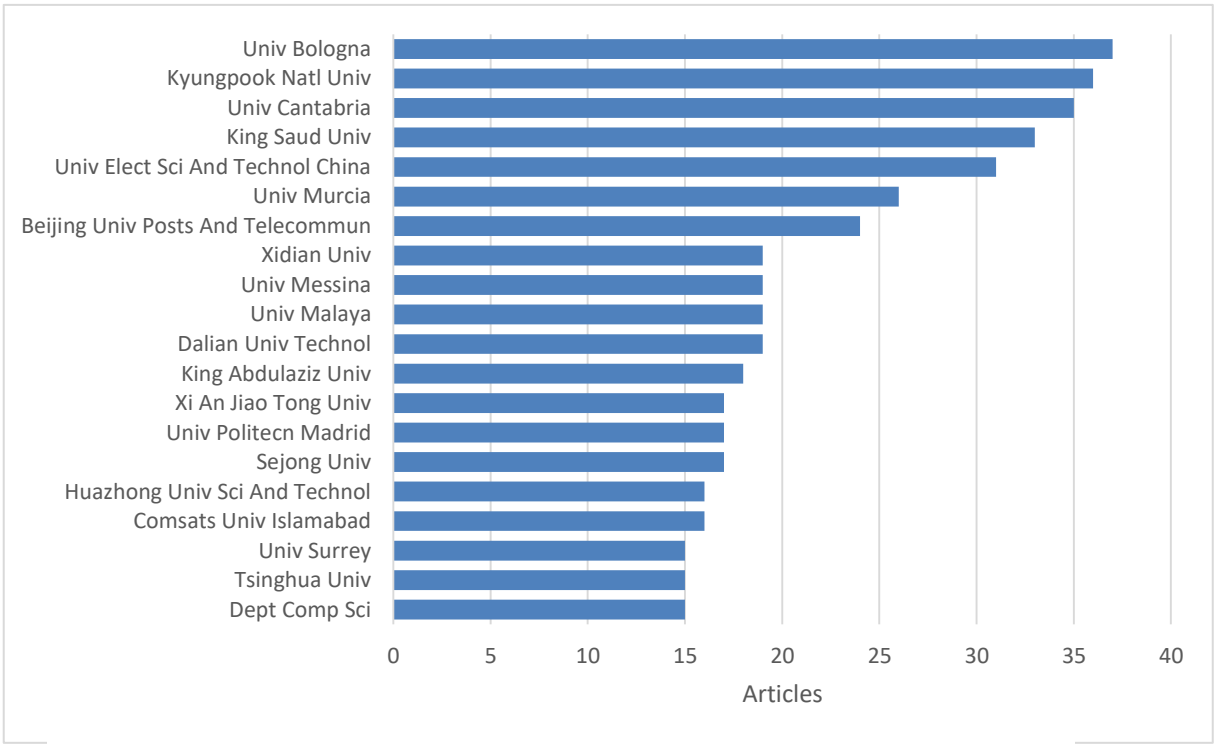


	Italy	China	USA	Spain	UK	Australia	S.Korea	India	Canada	Greece	Malaysia	S.Arabia	France	Iran	S.Africa
Total Citations	5188	4422	2993	2359	1830	1775	1687	1068	788	713	680	558	458	415	377
Total Article	402	1403	548	446	337	227	355	663	169	97	103	223	129	57	18

Graph 2. Top 15 Countries

University-based contributions to publications are given in Graph 3. When the graph is examined, it is seen that the most active university on the subject is the University of Bologna. When the top 20 university rankings are examined, it is seen that a specific country does not dominate the field, and many countries are active on the subject. The ranking includes universities from many countries such as Kyunpook national university (Korea), University of Cantabria (Spain), King Saud University (Saudi Arabia), University of Electronic Science and Technology of China.



Graph 3. Top 20Universities

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4.2. Journal Statistics

It is critical to assess the state of academic publications when researching an academic field's progress. The publication's influence is revealed by the subject of the publication, as well as the writers and publishers and the publisher's standing in the field (Kim et al., 2020). The first 15 journals in Table 4 have the numbers of publications, h.indexes, and citation numbers included. Ieee Internet of Things Journal and Ieee Access is now considered the two most active journals in the field. "Future Generation Computer Systems -The International Journal of E Science" is followed by these two periodicals. Despite having more articles published in the "Sensors" journal, the journal "Future Generation Computer Systems: The International Journal of E science" has a higher citation count and h.index score.

Table 3. Top 15 Journals

Journal	h_index	T.Cit	N.of Pub.	PY_start
Ieee Internet Of Things Journal	28	5329	162	2014
Ieee Access	27	3299	203	2015
Future Generation Computer Systems-The International Journal of E science	27	3188	96	2016
Sensors	22	1727	170	2013
Ieee Communications Magazine	14	953	20	2013
Ieee Transactions on Industrial Informatics	12	565	19	2017
Sustainable Cities and Society	11	465	50	2017
Ieee Communications Surveys and Tutorials	11	1091	17	2017
Sustainability	10	190	32	2016
Ieee Internet Computing	9	333	12	2013
Computer Communications	8	384	28	2015
Journal of Network and Computer Applications	8	325	16	2017
Technological Forecasting and Social Change	8	254	10	2018
Wireless Personal Communications	7	158	22	2014
Computer Networks	7	893	17	2014

The table here shows the total performance of the journals for ten years. While some journals lose their effectiveness over time, journals that were not active in the early period may become active later. The publication frequency of the journals affects the number of publications on the subject. It may cause the cumulative results of a journal that started its publication life to be higher. On the contrary, a journal that started its publication earlier may have too many publications on the subject in the early periods. Thus its cumulative scores may be high. It is possible to encounter a different picture when a more detailed and time-based analysis is made. For this purpose, a second analysis was made using the burst detection algorithm developed by Jon Kleinberg. The burst detection algorithm is an algorithm designed to detect activities that intensify over time and decrease (Kleinberg, 2003). With this algorithm, the publications of the journals on the subject were analyzed according to a specific period. As a result of the analysis, the journals whose activities are concentrated in specific periods in the field are shown in Graph 4. In the graph, the horizontal axis shows the period, and the black horizontal bars on the vertical axis show the impact forces of the magazines. The elongation of the black horizontal bars indicates that the magazine is more effective in more time intervals, and its thickening indicates that its effect increases.

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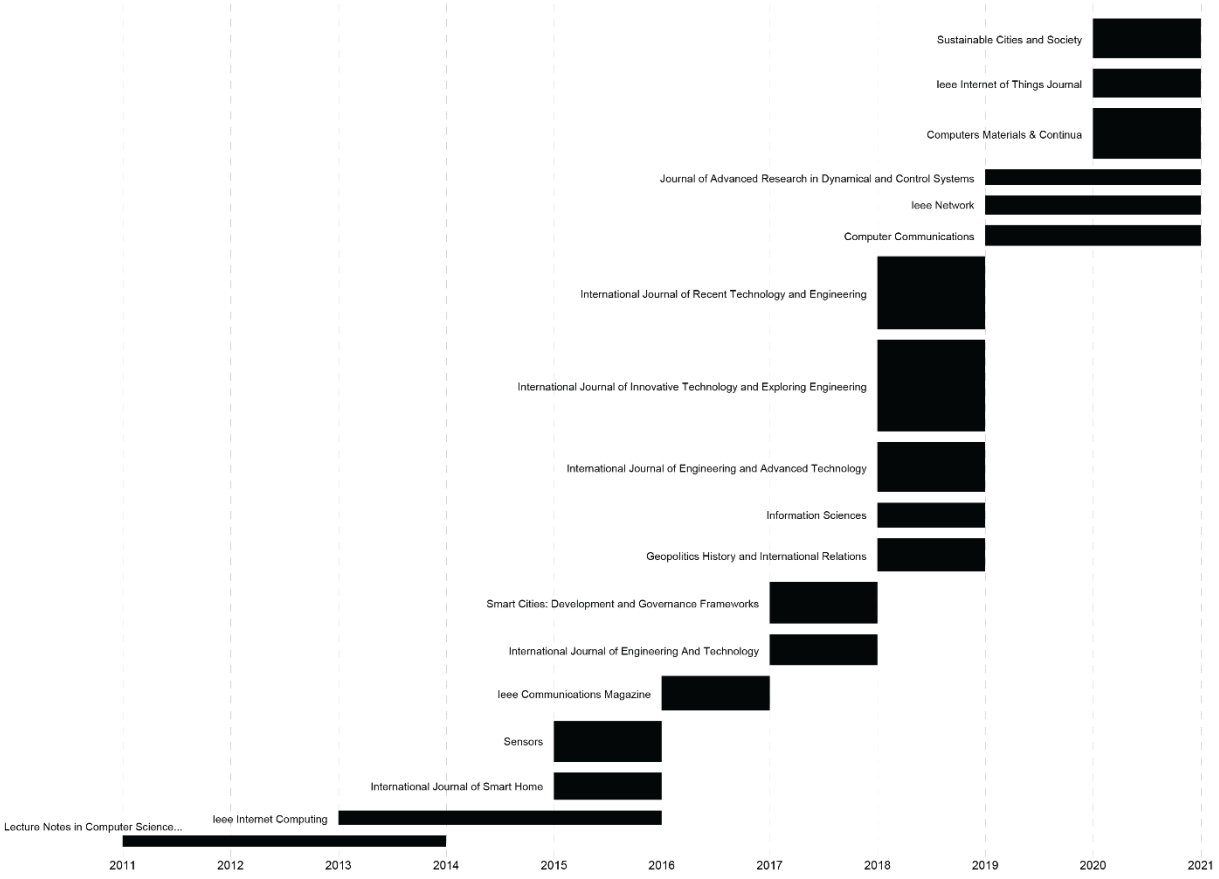

Graph 4. Journal Bursts by Year

The results in the graph will also contribute to a more accurate interpretation of Table 4. As shown in the figure, there is no absolute effectiveness of a single journal during the elapsed time. The effectiveness of "Ieee Internet Of Things Journal," which is in the first place in Table 4, was between 2020-2021. The journals "Ieee Access" and "Future Generations Computer Systems-The International Journal of E science," ranked second and third in the table, could not come to the fore in burst detection analysis. It means that some journals that could not be listed in the table despite being seen in the graph were more active than in the relevant years. "Sensors," which is in fourth place in the ranking in the table, exploded between 2015-2016. When the number of publications and citations of the "Ieee Internet Of Things Journal" is examined, it can be said that it significantly impacts the literature on the subject within the said 1-year period.

4.3. Keyword Analysis

The keywords in an article are a concise and accurate summary of the primary topic of the post. In the process of analyzing publications for bibliometric value, several emphasis points are utilized for content extraction. The focal points of the publication are its abstract, keywords, and structure. This study found that keywords were used as the primary focus to observe the subject's evolution through time. Because keywords do not require as much data preparation, they are better for search results. It is not straightforward to extract groups of two, three, and four words from full-text or abstract reviews. Even if an algorithm treats "cloud computing" and "cloud computing systems" as having very high consistency in a specific text, it is a problem that it does so. When requested to do binary grouping, the more likely outcome is that the algorithm will find all blocks labeled "cloud computing" and groups them under that term. In contrast, "systems" will be found as a different notion. Unlike traditional keyword-based keyword matching, there is no requirement to separate keywords, and concepts sought to be attained can be reached with very high consistency.

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The 24 most frequently repeated words in publications are given in Table 5. Accordingly, the word with the highest frequency of observation is the word "cloud computing." The words "big data" and "security" follow. When the frequencies are examined, it is seen that the most repeated concepts are mostly current concepts. It is maybe due to the increase in publications over time. More detailed results will be mentioned in other analyzes related to keywords.

Table 4. Most Frequent Words

Words	Occurrences	Words	Occurrences
cloud computing	165	smart home	52
big data	164	artificial intelligence	46
security	143	internet	46
wireless sensor networks	116	authentication	38
edge computing	99	energy efficiency	37
blockchain	95	smart grid	34
fog computing	86	intelligent transportation system	32
machine learning	85	Lora	29
sensors	78	sustainability	29
privacy	68	cloud	28
5g	60	monitoring	28
deep learning	60	optimization	28

A popular exploratory data analysis tool is multidimensional scaling, which illustrates the connections between the studied topics. The keywords used in the multidimensional scaling analysis were found to be dispersed across the coordinate plane in the resulting graph. Because the keywords are moving closer together, their relative positions represent their convergence. In the context of our discussion, more convergent words create a set. They provide a foundation for relevant literature to the extent that a term is situated toward the middle of the cluster (Hoffman & De Leeuw, 1992). In the end, a factorial map of the clusters can be calculated as a result of the research. Figure 1 demonstrates the multidimensional scaling methodology used to generate the factorial map.

As a result of the analysis, the keywords were collected in 5 main clusters.

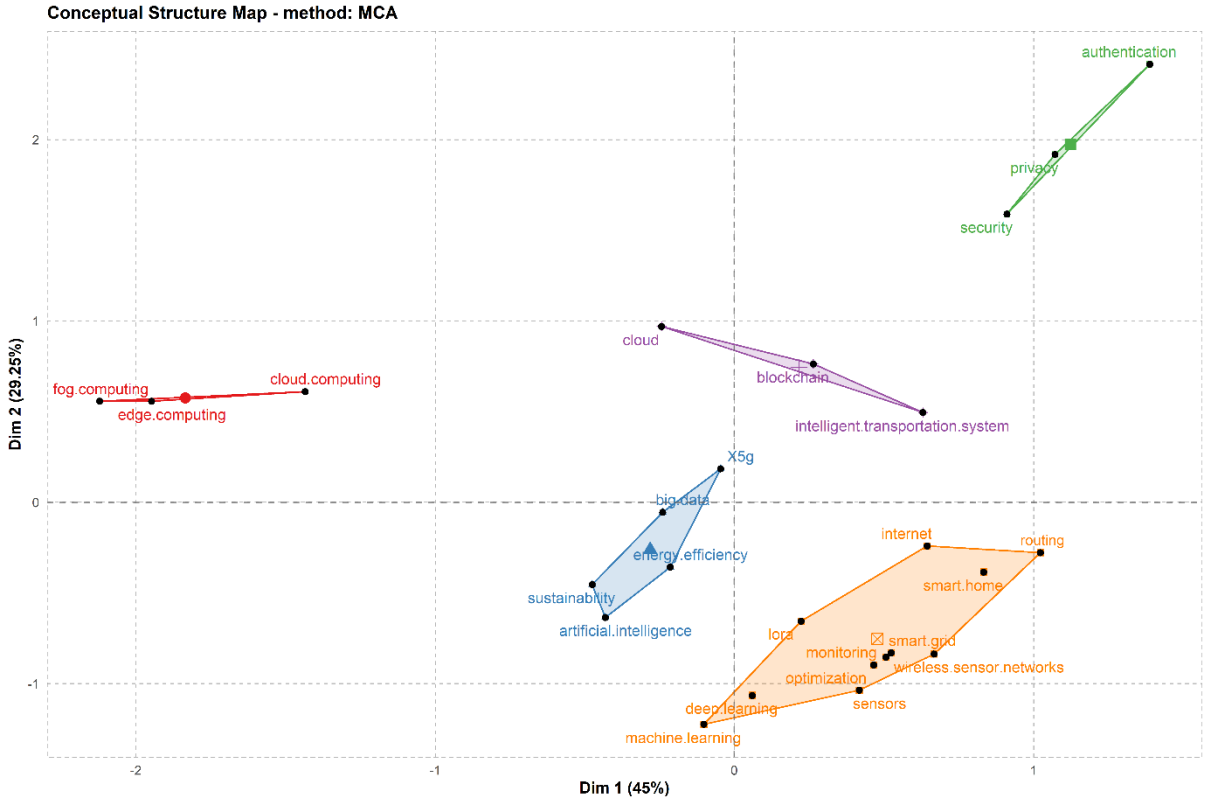

Figure 1. Multidimensional Scaling Analysis of Keywords

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The first cluster includes the concepts of authentication, privacy, and security. The factorial map shows that the concept of privacy occupies a more central position. It can be interpreted as the importance of protecting personal privacy in studies on smart cities. For the sustainability of smart city systems, smart devices must be integrated into the system. Smart devices also need some environmental data to perform their functions. This data is collected from the environment via sensors or obtained from other smart devices. Since the system remains connected to each other and requires uninterrupted data flow, it will be vulnerable to attacks. Of course, some hackers want to abuse intelligent systems (Lin et al., 2017). Logically, academic studies on taking precautions against these pirates converge within the same cluster.

Cluster 2 includes cloud computing, edge computing, and fog computing, and edge computing is located close to the center. Developing digital technologies has dramatically increased the amount of data produced. Especially with the Internet of things, every object connected to the cyber-physical system has started to produce data at an incredible size. In the future, the Internet of things technology will be the biggest feeder of big data. Transmitting vast amounts of raw data over a network places a massive strain on network resources.

It is more efficient in some circumstances to process data as close to its source as possible and only transfer data of value to a remote data center (Yu et al., 2018). So, as a result, it is reasonable to conduct academic studies on the more efficient use of big data in smart city initiatives.

The third cluster includes the concepts of cloud, blockchain, and intelligent transportation systems. In this cluster, the concept of blockchain is more central. When the thematic evolution graph is examined (Figure 3.), it is seen that the blockchain has been the primary concept since 2019. It can be interpreted as researching the contributions of blockchain in intelligent transportation systems, especially in studies conducted in terms of smart cities in recent years. A new digital smart city ecosystem has emerged, and it is all because of the fast adoption of blockchain technology. Decentralized technologies such as blockchain and bitcoin could assist in risk management and financial services, IoT, and public and social services. Smart city network architecture is also being revolutionized by the confluence of Artificial Intelligence (AI) and blockchain technology, thus facilitating the establishment of sustainable ecosystems (Singh et al., 2020).

The fourth cluster consists of five factors: artificial intelligence, 5G, sustainability, big data, and energy efficiency. The concept of energy efficiency is the most prominent notion within this cluster. It is believed that these principles, because of their tremendous capacity to assist in making cities more sustainable, will be critical to the IT infrastructure of smart, sustainable cities, a method for city development (Bibri, 2018). There is numerous research on 5G, artificial intelligence, and big data as it relates to sustainability and efficiency in the literature (e.g. (Jiang & Song, 2016), (Orsino et al., 2016), (Plageras et al., 2018)). These notions are clustered since the process is comprehensible. The core premise is that there are aspects of smart city research in which energy efficiency can be viewed as a priority. Also, it is possible to say that another key goal is to make the building as energy-efficient as possible.

In the 5th cluster, there are the concepts of Internet, smart home, routing, machine learning, deep learning, iora, sensors, wireless sensor networks, optimization, smart grid, and monitoring. In the closest position of the cluster to the center, there is smart grid. After that, optimization, monitoring, and smart home are more central. It is understood from this that some of the studies on smart urbanism focus on the smart grid and smart home systems. Studies have dealt with tracking optimization issues in smart grid systems. Smart cities will be able to manage current resources using modern information and communication technology. For this purpose, smart grid systems emerge as complex systems where it is possible to monitor and control energy-producing and consuming assets in detail. It will result in better approaches to increase energy efficiency (Karnouskos & Holland, 2009). Therefore, it is understandable that studies centered around smart grids, monitoring, and optimization concepts.

Power, structure, and the theme content of publications can be seen through theme evolutionary analysis, shifting rules, evolutionary relationships, and trending content. Thematic evolutionary analysis can determine the field's evolutionary path, change in the field, and use the current moment to forecast future developments. The size of each node in the thematic diagram is related to the number of various keywords utilized in the subject. When connected a node to other nodes, it can discovered the relationship's relational significance. These connections demonstrate that the concept has

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endured for a long period. The broader the relationships, the more similar the concepts are to one another. Stronger connections lead to broader lines (Cobo et al., 2011).

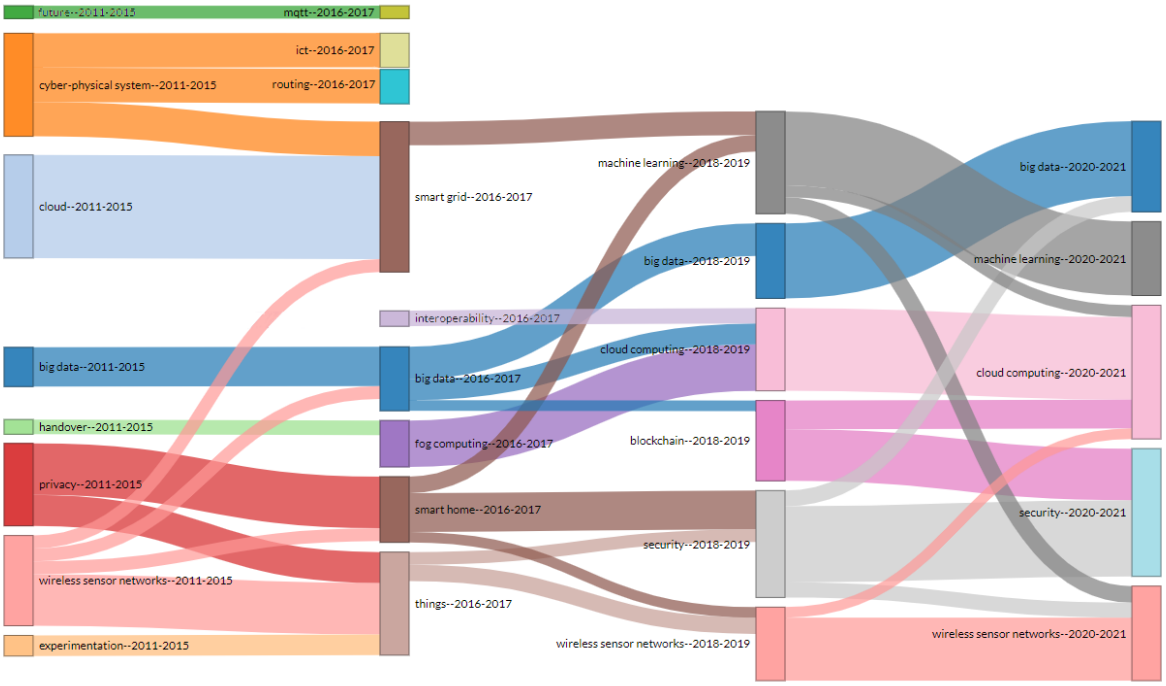

Figure 2. Thematic Evolution of Digitalization in Supply Chains

The literature on the subject was examined in four periods in proportion to the number of publications at specific intervals. In the first period between 2011 and 2015, it is observed that the concepts of a cyber-physical system, cloud, privacy, and wireless sensor networks related to smart cities and the Internet of things came to the fore, and other concepts were concentrated around these concepts. According to these results, it is understood that academic interest in smart cities and the Internet of things turned to infrastructure technologies in the first period. In the second period (2016-2017), it is seen that new concepts have emerged due to technological developments, and the interest in cyber-physical systems and related concepts has increased. The concepts of a cyber-physical system, cloud, and wireless sensor networks, which are among the concepts emphasizing the technological infrastructure in the first period, are related to smart homes and smart grids, cyber-physical system applications in the second period. In addition, the concept of objects gained importance in the literature in this period. When the third period (2018-2019) is examined, it is seen that the concepts of machine learning, security, blockchain, and cloud computing have come to the fore. In addition, the concept of wireless sensor networks has gained importance again. Recently (2020-2021), cloud computing and security concepts have come to the fore. Wireless sensor networks, security, and big data concepts also maintain their importance.

4.4. Burst Detection of Keywords

The burst detection analysis results of the keywords are given in Graph 5. In the first period, the concepts of future, sensor and actuator networks, mobility, ubiquitous computing, digital city, and intelligent system come to the fore. Among these concepts, the concept of ubiquitous computing has been active for the longest time, maintaining its effectiveness from 2012 to 2016. It is seen that the studies carried out in 2015 focused on the concept of internet/web technology at a very high level. In 2020, the concept of distributed ledger technology came to the fore.

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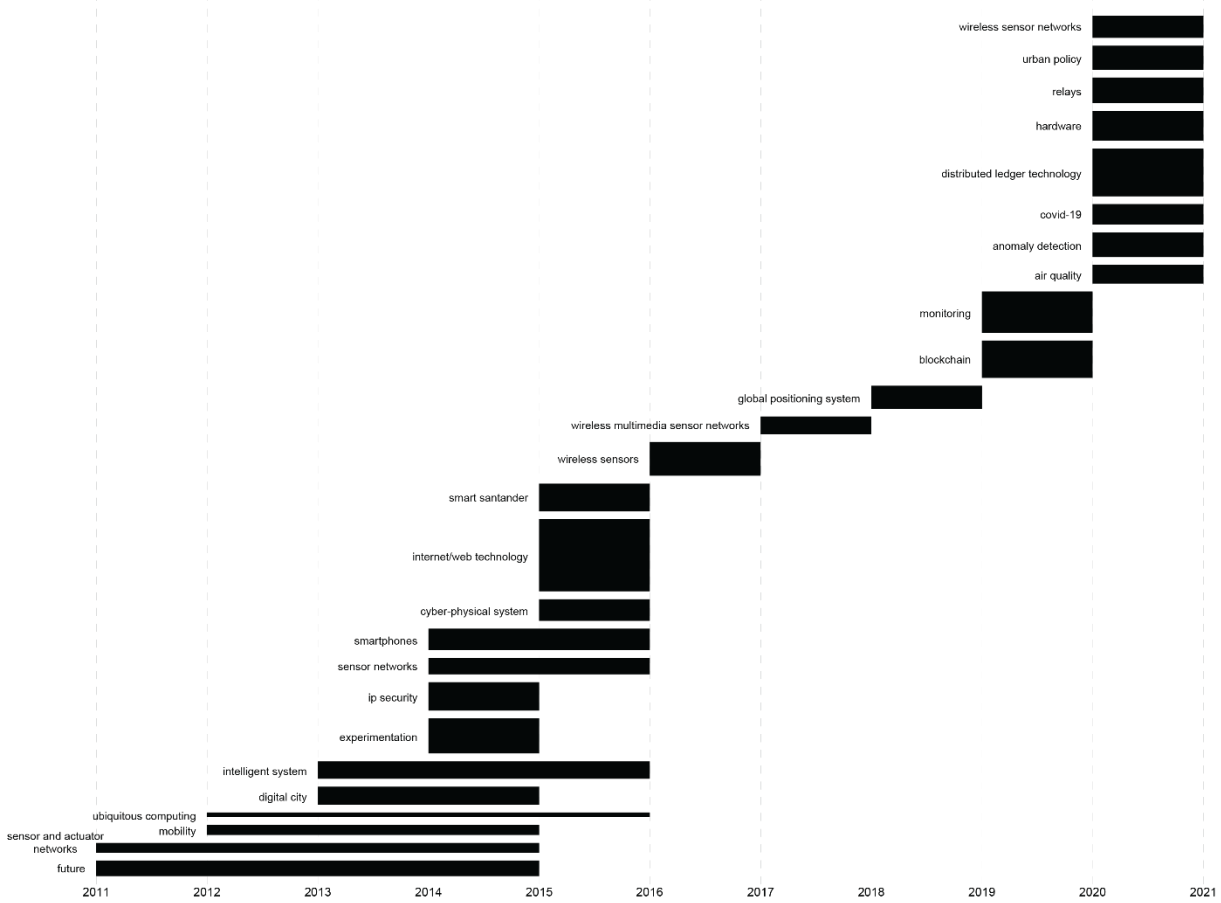

Graph 5. Bursts of Keywords

5. Conclusion

Technological development creates significant advantages in social life and changes the understanding of social welfare. However, it also brings with it several difficulties such as cost, know-how, and so on. There is an intense interest in the subject both in practice and in the academic community. This study aims to obtain a general perspective by presenting the available information on the subject. It aims to provide a guide for possible areas that can guide future work. In this context, studies on smart cities and the Internet of things have been examined. According to the results of the analysis, the trend towards the subject is increasing day by day. The most important actors of this trend were Italy, China, USA, Spain, and England. Of these countries, China has the highest number of publications, but Italy has the highest citations. If we consider the citations per publication as a measure of scientific productivity, the ranking will be Italy, USA, UK, Spain, China. This situation can be interpreted as an academic reflection of innovative urban practices in Europe and America.

Although the analysis to identify the relevant universities is similar to the analysis for countries, the results are pretty different. The top three countries in the country ranking are Italy, China, and the USA, while South Korea and Saudi Arabia universities are on the list. This situation reveals that some universities focus more on publications, especially on smart cities. While the USA is at the top of the country rankings, US universities are behind in the university rankings.
One of the elements affecting the visibility, citations, and effect of papers is the quality of academic publications. Additionally, journal articles must also be accounted for when performing bibliometric analysis on a field. Ieee Internet Of Things Journal, Ieee Access, Future Generation Computer Systems: The International Journal of E-Science, Sensors, and Ieee Communications are the most influential IoT and connected technologies in smart cities. Criteria such as

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impact factor, indices, and H-index score are commonly used when evaluating academic publications. Two measurement methods were used to quantify the journals' contributions: published studies, H-index score, and citations. Though "IEEE Access" ranked second for publications, citation and h-index scores alter with time and activity. IEEE Internet of Things Journal has a higher h-index score and citations than most journals in this field.

Multidimensional scaling was made for the evolution of the literature, which is the primary focus of the study. Five clusters were obtained in the keyword analysis on the evolution of the literature. These clusters are shaped around edge computing concepts, blockchain, energy efficiency, smart grid, and privacy. Multidimensional scaling is a helpful analysis method to demonstrate the impact of IoT and connected technologies on smart cities.

With thematic evolution analysis, it is possible to see both the change and development of the subject. It may be projected that big data, machine learning, security, and wireless sensor networks will see additional development in the coming time because of the wide variety of research topics dedicated to the issues of smart cities and the Internet of Things. Energy efficiency is an idea that will always be critical in intelligent city designs. Furthermore, to successfully develop smart cities, it is needed to process enormous amounts of data with various machine learning techniques and artificial intelligence. Furthermore, as smart cities are networked systems, the system's security and wireless communication technology are vital components.

This study aims to contribute to the literature by creating a map of the Internet of things and connected technologies in smart cities with the results obtained. The bibliometric analysis method used in the research helps obtain the general map in question. Thus, it is thought that the study will give researchers an idea about the whole subject. Studying in this way can help increase knowledge on the subject by identifying key issues, trends, and directions of scientific evolution
.

The methodology applied in the study has some limitations. The most crucial criticism of this methodology is that the analyzed features of the articles (keyword, abstract) are too narrow. Therefore, it may not refer to the actual level of knowledge. With more comprehensive literature reviews, we can obtain more complete results on the subject.

The method applied here also has an advantage. It is not possible to conduct a comprehensive content analysis on the data set in the current study. The bibliometric analysis provides more consistent results with less effort on datasets of this size. In addition, combining both WoS and SCOPUS databases in the study is another vital aspect of the study.

Despite all these limitations, it is thought that the study will contribute to the relevant literature in terms of understanding how technological developments, especially the Internet of things technology, shape smart cities, determining and visualizing the current level of knowledge on the subject, and presenting an academic perspective on the subject.

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