

# Behavioral Tendency Analysis towards E-Participation for Voting in Political Elections using Social Web

Hussain Saleem<sup>1\*</sup>, Jamshed Butt<sup>2</sup>, Altaf H. Nizamani<sup>3</sup>, Amin Lalani<sup>4</sup>, Fawwad Alam<sup>5</sup>, Samina Saleem<sup>6</sup>

\*Corresponding Author: [hussainsaleem@uok.edu.pk](mailto:hussainsaleem@uok.edu.pk)

<sup>1</sup>Department of Computer Science, UBIT, University of Karachi, Karachi, Pakistan.

<sup>2</sup>PAF-KIET Pakistan Air Force – Karachi Institute of Economics & Technology, Karachi, Pakistan.

<sup>4</sup>The Cyber Bridge, Karachi, Pakistan

## Abstract

The issue “Exploring Social Media and Other Crucial Success Elements of Attitude towards Politics and Intention for Voting in Pakistan” is a huge study embracing more issues. The politics of Pakistan is basically the politics of semantic groups. Pakistan is a multilingual state more than six languages. There are 245 religious parties in Pakistan, as elaborated by the Daily Times research. The use of social media sites in Pakistan peaked to its maximum after announcement of election schedule by the Election Commission of Pakistan in March 22, 2013. Most of the political parties used it for the recent elections in Pakistan to promote their agenda and attract country’s 80 million registered electors. This study was aiming to investigate the role of social media and other critical variables in the attitude towards politics and intention for voting.

## Keywords:

*Social Media; E-Participation; Behavioral Tendency Analysis; Political Elections; E-Voting;*

## 1. Introduction

This issue “Exploring Social Media and Other Crucial Success Elements of Attitude towards Politics and Intention for Voting in Pakistan” is a huge study embracing more issues. E-participation plays an important component to expand politics opportunities by allowing seniors for connecting with each other and using their elected staff. E-participation utilization in Pakistan is developed after the attacks of 11th-September-2011. This kind of study endeavours to understand behaviour and intention of Pakistani people about the effects of sociable press and also other critical elements in political attitude and voting intention (Khan & Shahid 2010).

In 1947 Pakistan had its dependence from United Kingdom, and the political system that governance the Pakistan state continuously changed between democratic military and rule dictatorships. Three attempts in a vastly operational democratic changeover of power in the past produced an assassination, a military jour and a great hassle of martial rules. However , the fifth greatest democracy found in the world, witnessed a historical event in the recently country’s democratic process because the 2013 General Election provided the first ever democratic transfer of power. The latest votes too had been blemished by simply attack but that didn't break the people right from voting in good sized quantities and documenting amongst the best playoff turnout costs in Pakistan’s election background.

The 2013 General Election witnessed the also introduction of social mass media, which include Twitter, since an instrument of election marketing campaign and electoral mobilization (Masood 2013). Designed for the very first time on Pakistani politics social marketing played a dynamic role, because violent attacks on partly political rallies before obligated political people to place a larger focus on the internet promotioning in this selection (Ahmed & Skoric 2014).

Pakistan have a very high diversity of demographic structure such as ethnicity, religiosity, and language. As estimated in 2014, Pakistan population hits 196 million people as the seventh country worldwide. The distribution of ethnicity shows the following statistics: “Punjabi 44.68%, Pashtun (Pathan) 15.42%, Sindhi 14.1%, Sariaiki 8.38%, Muhajirs 7.57%, Balochi 3.57%, other 6.28%”. The religions distribution shows the following distribution: “Muslim (official) 96.4% (Sunni 85-90%, Shia 10-15%), other (includes Christian and Hindu) 3.6%”. The Language distribution shows the following statistics: “Punjabi 48%, Sindhi 12%, Saraiki (a Punjabi variant) 10%, Pashto (alternate name, Pashtu) 8%, Urdu (official) 8%, Balochi 3%, Hindko 2%, Brahui 1%, English (official; lingua franca of Pakistani elite and most government ministries), Burushaski, and other 8%” (CIA WORLD FACTBOOK 2015).

Semantic groups plays a major role in Pakistani political status. Pakistan is a multilingual state, where the main six groups of the society have different six languages. The Pakhtuns, Sindhi, Balochi, Punjabi, Mahajir and Siraiki identities are expressed through Pashto, Sindhi, Balochi, Punjabi, Urdu and Siraiki languages. There are 245 religious parties in Pakistan, as elaborated by the Daily Times research. Of these, 28 openly take part in politics, 104 claim to focus on jihad and 82 on sectarian concerns. 20 parties are of ‘Tablighi’ proselytization. The remaining 23 are involved in activities of a mixed nature (Shehzad 2011; Awami Politics 2015).

Since 11th-September-2011, many countries of the global world, incorporating Pakistan, possess suffered

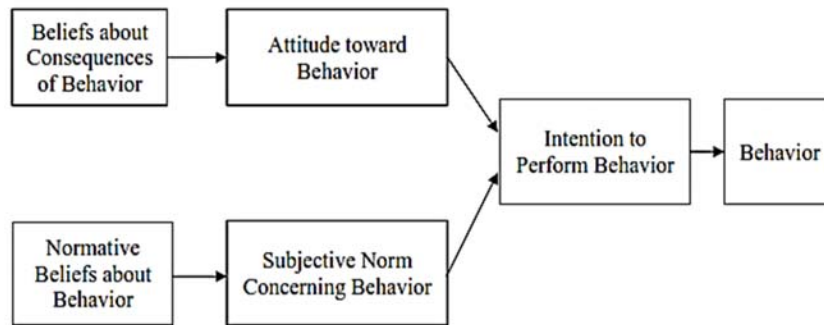


Fig.1. Behavioral Tendency.

substantial political lack of stability. Although democracy is in a delicate condition in Pakistan still, recently e-Participation utilization has been noticed to increase significantly because of the option of ICTs (Bertot et al. 2010, Hansen & Reinau 2006). Since teenagers, especially students, are definitely more acquainted with ICTs, it is therefore the youngsters in Pakistan that are in the forefront in using social mass media intended for e-Participation (Vicente & Novo 2014). A part of objectives of the study endeavors to comprehend behaviour and motives of residents in Pakistan about the make use of and ramifications of social media in political issues.

## 2. Social Media Use and Politics

While most of the people will relate social media to Facebook and Twitter, but Social media umbrella is wider and includes: multimedia sharing sites, blogs, forums, message boards, search engine marketing, Wikis, social networks, and other similar services (Wright 2009).

Social networking sites provide individuals a platform to: (a) construct a public/semi-public profile within a bounded system; (b) list other users with whom they share a connection; and (c) view and traverse their connections and those made by others within the system.(Ellison 2007, Ellison & Boyd 2013) Expanding capabilities of social media are generating larger social networks with more

dynamic and accessible content than was possible previously. Interviews with more than 200 university students born after 1982 (also categorized as ‘milléniales’) showed that the way people choose to use these technologies would shape our future communications. Social relations and culture are so intertwined it has become difficult to separate the two (Lewis et al. 2008; Lynd 2015) and it is, therefore, crucial to study the extensive nature of social media to understand culture (Riordan 2011).

Shared community spaces are a massive part of what excites young people and contribute to their persistence and motivation to learn (Rennie and Mason 2007). The same has recently been employed by politicians to urge the youth to cast votes in their favour in elections. It has to be highlighted here that bilingual bridge bloggers play a pivotal role in translating events in far-flung places for global audiences, giving them enormous power over the shape of the debates that take place in the international public sphere (Jericho 2013; Leung et al. 2013). This is particularly true when the state temporarily turns off the information spigot. As in the cases of Moldova, Kenya, and Egypt, social media networks can trigger informational cascades in authoritarian countries (Faris 2010).

Ben Ali’s government in Tunisia was long known for being one of the most sophisticated cyber-censorship regimes in the world. Alterman (2011) has stated that

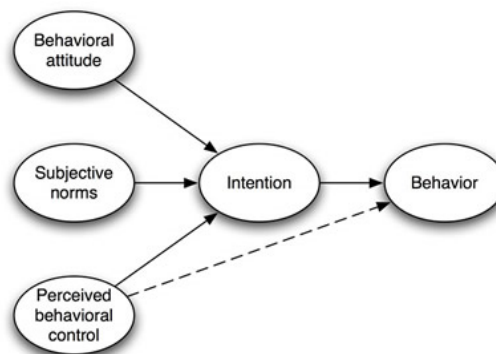


Fig.2. Intention Whereabouts.

Table-1: Public Interest to vote for election.

Characteristic		Frequency	Percent	Valid Percent	Cumulative Percent
<b>Gender</b>	Male	614	46.0	46.0	46.0
	Female	720	54.0	54.0	100.0
<b>Age</b>	18-22 year	404	30.3	30.3	30.3
	23-30 year	467	35.0	35.0	65.3
	31-40 year	304	22.8	22.8	88.1
	41-50 year	81	6.1	6.1	94.2
	More than 50 year	78	5.8	5.8	100.0
<b>Income</b>	Less than 21 k Rs.	519	38.9	38.9	38.9
	22-25 k Rs.	279	20.9	20.9	59.8
	26-50 k Rs.	379	28.4	28.4	88.2
	51-75 k Rs.	91	6.8	6.8	95.1
	More than 75 k Rs.	66	4.9	4.9	100.0
<b>Marital Status</b>	Single	575	43.1	43.1	43.1
	Married	626	46.9	46.9	90.0
	Divorce	70	5.2	5.2	95.3
	Widowed	63	4.7	4.7	100.0
<b>Education</b>	Primary	160	12.0	12.0	12.0
	Matriculation	196	14.7	14.7	26.7
	Intermediate	234	17.5	17.5	44.2
	Bachelors	476	35.7	35.7	79.9
	Postgraduate	268	20.1	20.1	100.0
<b>Ethnic Group</b>	Punjab	561	42.1	42.1	42.1
	Pathan	194	14.5	14.5	56.6
	Sindhi	193	14.5	14.5	71.1
	Saraiki	120	9.0	9.0	80.1
	Muhajir	160	12.0	12.0	92.1
	Balochi	74	5.5	5.5	97.6
	Others	32	2.4	2.4	100.0

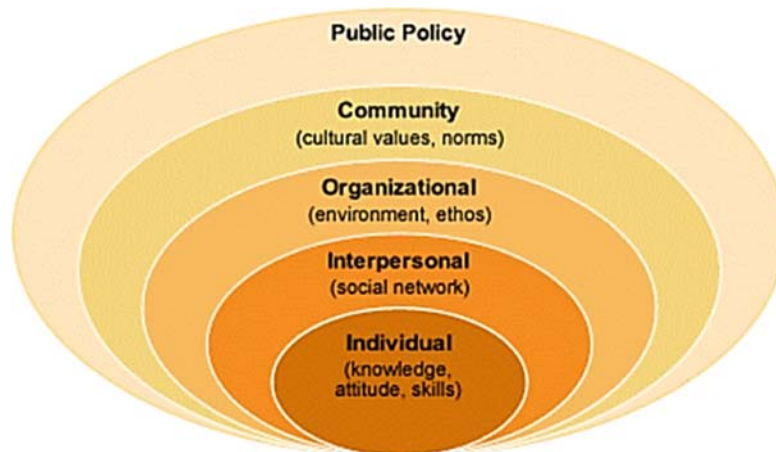


Fig.3. Social Ecological Model (SEM).

Tunisian authorities won its reputation “for being extremely internet-savvy and using its own tech-mechanisms for blocking sites and monitoring each and every single movement cyber-activists would want to do against the regime.” Even so, by the end of 2010, circulation of WikiLeaks documents, that revealed Ben Ali’s corruption, among the Tunisian youth put the regime on alert (Salanova 2011; Alterman 2011).

In the case of Egypt, when ten activists of the Arab spring were interviewed, they revealed that although the battle for equal rights had been going on for several years, social media acted as a motivator that enabled the people topple over the government that was in power for 30 years, within days. While social media did not initiate the Arab Spring, it certainly affected the intensity of the movement (Mullin & Patel 2015). The user created generated content which was uploaded on Blogs, YouTube and social networking sites like Facebook and Twitter spawned a lot of angry responses from the Egyptians that pushed them to rise against the system (Rashid 2011; Gikas & Grant 2013).

### 3. Underpinning Theories

Theoretical framework and conceptual framework are an intermediate playground that challenge to link to all facets of investigation (e.g., problem definition, purpose, literature review, methodology, data collection, and analysis). For this research, a collection of theories is the base for the proposed concepts and model. The underpinning theories for this research are theory of reasoned action (TRA), theory of planned behaviour (TBP), Social Cognitive Theory (SCT), Social Ecological Model (SEM), and The Hofstede’s cultural framework.

The proposed model is integrating different variables that inherited from many underpinning theories. Theory of reasoned action (TRA) and theory of planned behaviour (TBP) contributes to the proposed variables, Intention for voting, Attitude towards voting, and Subjective norms.

Social Cognitive Theory (SCT) contributes to the integration of cultural factors such as collectivism and power distance. Social Ecological Model (SEM), is essential theory that contributes to the integration of Attitude, Social Media, and Society characteristics such as religiosity and ethnicity. Finally, the Hofstede’s cultural framework contributes to the integration of cultural factors such as collectivism and power distance. The different underpinning theories, plays different roles with literature to formulate the proposed model.

### 4. Conceptual Development to the proposed Model

Fig.4. shows the research proposed model that merged the dimensions from different theories in order to achieve the aim of this research. The variables introduced in this research are Social Media, Ethnicity, Collectivism, Religiosity, Power Distance, Subjective Norm, Attitude towards Politics, and Intention for Voting.

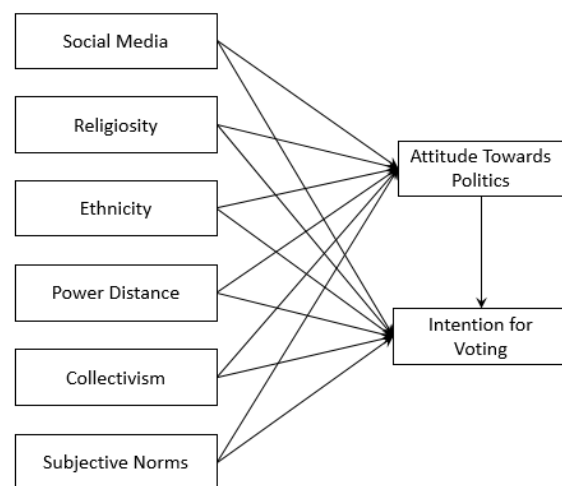


Fig.4. Proposed Model

## 5. Social Media or Social Web

Social media (SM) is one the most revolutionary utilization of the modern interactive internet that known as Web 2.0. The term refers to the virtual communities that constructed from different people anywhere at any time without any boundaries. Those virtual community members can create and diffuse their thought, ideas, emotions and any other content textual or multimedia to the virtual community they want; the member can interact, share, exchange, comment any content in a freestyle manner. With the evolution of internet access devices, virtual community members can access the desired social media by using desktops, laptops, tablet, or smartphones. The revolution of social media change the way marketers, politicians, and many others use for campaigns and communicate with public and society members. The act of writing was the act of sharing (Wang et al. 2012). Social media widespread in most of the societies and the fast spread of news within these virtual societies encourage more and more voters to relay on the social media during the political process (Birkbak 2013). It is clear that whenever publics heavily using the Internet, they will explore political news and formulate political communities on the net and propitiations have no choice to use it (Enli et al. 2013). According to social media experts, Facebook undeniably played a very important role in the lawyers' movement against General Musharraf in March 2007. While Facebook was the meeting point for cyber activism, Twitter was useful in spreading the word out to the broader world. It significantly helped in gaining the attention of the world community (Minhas et al. 2015). Recent cases in Egypt, Tunisia, and Lebanon in 2011 are proof that social media can play a role in instigating political change (Faris 2010; Patel 2015; Xenos et al. 2014; Kemp et al. 2015). Therefore, the study tested the following preposition:

- Social media has a significant positive relation with attitude towards politics.
- Social media has a significant positive relation with intention for voting.

## 6. Attitude towards Politics

Attitudes are abstracted as a mixture of the beliefs about behavioral results an individual associates with a behavior, as well as positive or negative evaluations of these outcomes. Individuals may hold many different beliefs about the outcomes of a particular behavior, but only some of these beliefs are accessible at any given time. These salient behavioral beliefs, defined as considerations about the probability of a behavior producing a given outcome, combine to form an individual's attitude toward the behavior (Ajzen & Fishbein, 1980). In accordance with Fishbein and Ajzen's (1975) expectancy—value model, attitude toward a behavior is calculated by summing all accessible behavioral beliefs linking the behavior to various outcomes. The strength of each belief (b) is weighted by the evaluation (e)

of the outcome or attribute, and the products are aggregated (Fishbein&Ajzen, 1975). One's attitude toward voting preservation millage is likely to encompass a number of evaluative behavioral beliefs. Therefore, identification of the beliefs is a first step in testing the TRA. In order to understand voters' attitudes researchers must pin point which outcomes voters believe are most likely to occur given the passing of the millage and how positively or negatively they value each of these outcomes. Identifying these factors is critical for communicators because these beliefs or the evaluations of these beliefs can be targeted for change with communication activities (Maloney et al. 2013). Therefore, the study confirmed the following preposition:

- Attitude towards politics has a significant positive relation with intention for voting.

## 7. Intention for Voting

There are a number of models that inspect the joint role of normative effect and attitudes on behaviors including Ajzen and Fishbein's (1980) TRA and the theory of planned behavior (TPB; Ajzen 1985). According to the TRA, variables such as demographics play a role in creating behavioral and normative beliefs an individual has about a behavior intention. These behavioral and normative beliefs combine to shape the individual's attitudes and subjective norms, which are indirect predictors of behavior intention. Voting is a planned action that involves a single, concrete behavioral act, and thus provides a good context for understanding the social and psychological predictors. Studies that have examined predictors of voting behavior, however, have been limited. Past research has applied the TRA both to investigate the success of getting out the vote efforts (Johnson 2007) and to assess directional voting compliance in candidate elections (Singh et al. 1995) and find results consistent with the model. Nevertheless, as noted previously, referendum voting is distinct from general election voting in that it involves significant cost to many voters (i.e., those who own property) and the outcomes of the act may not be immediate or tangible (Maloney et al. 2013; Ajzen & Fishbein 1980; Cialdini et al. 1990).

## 8. Conclusion

Social media is defined as a collection of applications and tools that are worked on the web and internet environment which known as Web 2.0, and it enables users to create and actively interact with a shared contents. While most of the people will relate social media to Facebook and Twitter, but Social media umbrella is wider and includes: multimedia sharing sites, blogs, forums, message boards, search engine marketing, Wikis, social networks, and other similar services. Social media in politics can be used as a tool for closure announcement and synchronization at a lower cost, although they cannot be seen as substances of any revolution in and of themselves. There are currently

more than 35 million of the total population is subscribing to Internet usage across the country. The number of active social media users in Pakistan has also surpassed 31 million. The growth trend with reference to 2016 stats, and concludes that the digital growth has significantly surged with 20% increase in internet users. There has been a 35% rise in social media users. Facebook, according to Internet traffic monitoring data, is currently the most popular website in Pakistan. Democracy in Pakistan, however imperfect, has never been allowed to function. Until 2013, Pakistan did not experience even one democratic transfer of power from one democratically elected government that had completed its tenure to another. Pakistan is a multi-party democracy that at times has been subject to military government. The Parliament of Pakistan is bicameral, consisting of the National Assembly of Pakistan and the Senate. The politics of Pakistan is basically the politics of semantic groups. Pakistan is a multilingual state, where the Pakhtuns, Sindhi, Balochi, Punjabi, Mahajir and Siraiki. For religious in Pakistan, an estimation of two hundred forty five religious-based parties, but only twenty-eight parties are involved in political activities. Other parties are involved on jihad and sectarian issues.

## References

- [1] X. Ding, G. Ding, X. Xie, F. Huang, and M. Jiang, "Direct growth of few layer graphene on hexagonal boron nitride by chemical vapor deposition," *Carbon*, vol. 49, no. 7, pp. 2522-2525, 2011.
- [2] K. Zhang, F. L. Yap, K. Li, C. T. Ng, L. J. Li, and K. P. Loh, "Large Scale Graphene/Hexagonal Boron Nitride Heterostructure for Tunable Plasmonics," *Advanced Functional Materials*, vol. 24, no. 6, pp. 731-738, 2014.
- [3] J. Wang, Z. Wang, H. Cho, M. J. Kim, T. K. Sham, and X. Sun, "Layer speciation and electronic structure investigation of freestanding hexagonal boron nitride nanosheets," *Nanoscale*, vol. 7, no. 5, pp. 1718-1724, 2015.
- [4] W. Guo, H. A. Ma, and X. Jia, "The etching process of boron nitride by alkali and alkaline earth fluorides under high pressure and high temperature," *Materials Research Bulletin*, vol. 51, pp. 258-262, 2014.
- [5] O. Mitsuhiro, S. Takumi, W. Kenji, T. Takashi, H. Hiroki, S. Hisanori, and K. Ryo, "Direct Chemical Vapor Deposition Growth of WS<sub>2</sub> Atomic Layers on Hexagonal Boron Nitride," *ACS Nano*, vol. 8, no. 8, pp. 8273-8277, 2014.
- [6] S. Tang, H. Wang, Y. Zhang, A. Li, H. Xie, X. Liu, L. Liu, T. Li, F. Huang, X. Xie, and M. Jiang, "Precisely aligned graphene grown on hexagonal boron nitride by catalyst free chemical vapor deposition," *Scientific Reports*, vol. 3, no. 2666, pp. 1-7, 2013.
- [7] X. Ding, "Direct synthesis of graphene quantum dots on hexagonal boron nitride substrate," *Journal of Materials Chemistry C*, vol. 2, pp. 3717-3722, 2014.
- [8] H. Tokoro, S. Fujii, and T. Oku, "Synthesis of boron nitride and carbon nanomaterials through a solid phase reduction process," *Materials Chemistry and Physics*, vol. 114, pp. 204-212, 2009.
- [9] G. Teng, S. Xiuju, D. Huiwen, N. Yufeng, C. Yubin, J. Qingqing, S. Jingyu, Y. Yanlian, Z. Yanfeng, and L. Zhongfan, "Temperature-triggered chemical switching growth of in-plane and vertically stacked graphene-boron nitride heterostructures," *Nature Communications* 7835, vol. 6, no. 6835, pp. 1-8, 2015.
- [10] R. B. Ganesh, K. Daniel, and A. R. Joshua, "Large-scale synthesis and functionalization of hexagonal boron nitride nanosheets," *RSC Nanoscale communication* vol. 6, pp. 11671-11675, 2014.
- [11] S. Yangxi, Z. Changrui, L. Bin, D. Guqiao, J. Da, W. Haomin, and X. Xiaoming, "Van der Waals epitaxy and characterization of hexagonal boron nitride nanosheets on graphene," *Nanoscale Research Letters*, vol. 9, no. 367, pp. 1-7, 2014.
- [12] K. H. Lee, H.-J. Shin, B. Kumar, H. S. Kim, J. Lee, R. Bhatia, S.-H. Kim, I.-Y. Lee, H. S. Lee, G.-H. Kim, J.-B. Yoo, J.-Y. Choi, and S.-W. Kim, "Nanocrystalline-Graphene-Tailored Hexagonal Boron Nitride Thin Films," *Angewandte Chemie* vol. 126, pp. 11677-11681, 2014.
- [13] S. J. Kang, G.-H. Lee, Y.-J. Yu, Y. Zhao, B. Kim, K. Watanabe, T. Taniguchi, J. Hone, P. Kim, and C. Nuckolls, "Organic Field Effect Transistors Based on Graphene and Hexagonal Boron Nitride Heterostructures," *Advanced Functional Materials*, vol. 24, pp. 5157-5163, 2014.
- [14] C. Qiran, L. Lu Hua, Y. Yuanlie, L. Yun, H. Shaoming, C. Ying, W. Kenji, and T. Takashi, "Boron nitride nanosheets as improved and reusable substrates for gold nanoparticles enabled surface enhanced Raman spectroscopy," *RSC PCCP Paper*, vol. 17, pp. 7761-7766, 2015.
- [15] X. Ling, W. Fang, Y.-H. Lee, P. T. Araujo, X. Zhang, J. F. Rodriguez-Nieva, Y. Lin, J. Zhang, J. Kong, and M. S. Dresselhaus, "Raman Enhancement Effect on Two-Dimensional Layered Materials: Graphene, h-BN and MoS<sub>2</sub>," *Nano Letters*, vol. 14, pp. 3033-3040, 2014.
- [16] P. R. Kidambi, R. Blume, J. Kling, J. B. Wagner, C. Baecht, R. S. Weatherup, R. Schloegl, B. C. Bayer, and S. Hofmann, "In Situ Observations during Chemical Vapor Deposition of Hexagonal Boron Nitride on Polycrystalline Copper," *Chemistry of Materials*, vol. 26, pp. 6380-6392, 2014.
- [17] L. Song, L. Ci, H. Lu, P. B. Sorokin, C. Jin, J. Ni, A. G. Kvashnin, D. G. Kvashnin, J. Lou, B. I. Yakobson, and P. M. Ajayan, "Large Scale Growth and Characterization of Atomic Hexagonal Boron Nitride Layers," *Nano Letters*, vol. 10, pp. 3209-3215, 2010.
- [18] K. H. Lee, H.-J. Shin, J. Lee, I.-y. Lee, G.-H. Kim, J.-Y. Choi, and S.-W. Kim, "Large-Scale Synthesis of High-Quality Hexagonal Boron Nitride Nanosheets for Large-Area Graphene Electronics," *Nano Letters*, vol. 12, no. 2, pp. 714-718, 2012.
- [19] G. Kim, A. R. Jang, H. Y. Jeong, Z. Lee, D. J. Kang, and H. S. Shin, "Growth of High-Crystalline, Single-Layer Hexagonal Boron Nitride on Recyclable Platinum Foil," *Nano Letters*, vol. 13, pp. 1834-1839, 2013.
- [20] G. Yang, R. Wencai, M. Teng, L. Zhibo, Z. Yu, L. Wen-Bin, M. Lai-Peng, M. Xiuliang, and C. Hui-Ming, "Repeated and Controlled Growth of Monolayer, Bilayer and Few-Layer Hexagonal Boron Nitride on Pt Foils," *ACS Nano*, vol. 7, no. 6, pp. 5199-5206, 2013.
- [21] Z. Liu, Y. Gong, W. Zhou, L. Ma, J. Yu, J. C. Idrobo, J. Jung, A. H. MacDonald, R. Vajtai, J. Lou, and P. M. Ajayan, "Ultrathin high-temperature oxidation-resistant coatings of hexagonal boron nitride," *Nature Communications*, vol. 4, no. 2541, pp. 1-8, 2013.
- [22] Y. Shi, C. Hamsen, X. Jia, K. K. Kim, A. Reina, M. Hofmann, A. L. Hsu, K. Zhang, H. Li, Z.-Y. Juang, M. S. Dresselhaus, L.-J. Li, and J. Kong, "Synthesis of Few-Layer Hexagonal Boron Nitride Thin Film by Chemical Vapor Deposition," *Nano Letters*, vol. 10, pp. 4134-4139, 2010.

- [23] S. Nakhaie, J. M. Wofford, T. Schumann, U. Jahn, M. Ramsteiner, M. Hanke, J. M. J. Lopes, and H. Riechert, "Synthesis of atomically thin hexagonal boron nitride films on nickel foils by molecular beam epitaxy," *Applied Physics Letters*, vol. 106, pp. 213108(1-5), 2015.
- [24] R. Y. Tay, S. H. Tsang, M. Loeblein, W. L. Chow, G. C. Loh, J. W. Toh, S. L. Ang, and E. H. T. Teo, "Direct growth of nanocrystalline hexagonal boron nitride films on dielectric substrates," *Applied Physics Letters*, vol. 106, pp. 101901(1-5), 2015.
- [25] M. Wang, S. K. Jang, Y. J. Song, and S. Lee, "CVD growth of graphene under exfoliated hexagonal boron nitride for vertical hybrid structures," *Materials Research Bulletin*, vol. 61, pp. 226-230, 2015.
- [26] Y. Wei, C. Guorui, S. Zhiwen, L. Cheng-Cheng, Z. Lianchang, X. Guibai, C. Meng, W. Duoming, Y. Rong, S. Dongxia, W. Kenji, T. Takashi, Y. Yugui, Z. Yuanbo, and Z. Guangyu, "Epitaxial growth of single-domain graphene on hexagonal boron nitride," *Nature Materials Letters*, vol. 12, pp. 792-797, 2013.
- [27] Y. Jie, Q. Li, H. Yufeng, K. Shengyong, B. Xuedong, C. Yat-Ming, Z. Wenjun, and W. Enge, "Vertically Aligned Boron Nitride Nanosheets: Chemical Vapor Synthesis, Ultraviolet Light Emission, and Superhydrophobicity," *ACS Nano*, vol. 4, no. 1, pp. 414-422, 2010.
- [28] S. Tang, G. Ding, X. Xie, J. Chen, C. Wang, X. Ding, F. Huang, W. Lu, and M. Jiang, "Nucleation and growth of single crystal graphene on hexagonal boron nitride," *Carbon*, vol. 50, pp. 329-331, 2012.
- [29] M. S. Bresnehan, M. J. Hollander, M. Wetherington, K. Wang, T. Miyagi, G. Pastir, D. W. Snyder, J. J. Gengler, A. A. Voevodin, W. C. Mitchel, and J. A. Robinson, "Prospects of direct growth boron nitride films as substrates for graphene electronics," *Journal of Materials Research*, vol. 29, no. 3, pp. 459-471, 2014.
- [30] S. Caneva, R. S. Weatherup, B. C. Bayer, B. Brennan, S. J. Spencer, K. Mingard, A. Cabrero-Vilatela, C. Baecht, A. J. Pollard, and S. Hofmann, "Nucleation Control for Large, Single Crystalline Domains of Monolayer Hexagonal Boron Nitride via Si-Doped Fe Catalysts," *Nano Letters*, vol. 15, pp. 1867-1875, 2015.
- [31] R. Y. Tay, M. H. Griep, G. Mallick, S. H. Tsang, R. S. Singh, T. Tumlin, E. H. T. Teo, and S. P. Karna, "Growth of Large Single-Crystalline Two-Dimensional Boron Nitride Hexagons on Electropolished Copper," *Nano Letters*, vol. 14, pp. 839-846, 2014.
- [32] H. Wang, X. Zhang, J. Meng, Z. Yin, X. Liu, Y. Zhao, and L. Zhang, "Controlled Growth of Few-Layer Hexagonal Boron Nitride on Copper Foils Using Ion Beam Sputtering Deposition," *Materials Views (Small)* vol. 11, no. 13, pp. 1542-1547, 2015.
- [33] P. X. Feng, and M. Sajjad, "Few-atomic-layer boron nitride sheets syntheses and applications for semiconductor diodes," *Materials Letters*, vol. 89, pp. 206-208, 2012.
- [34] M. H. Khan, Z. Huang, F. Xiao, G. Casillas, Z. Chen, P. J. Molino, and H. K. Liu, "Synthesis of Large and Few Atomic Layers of Hexagonal Boron Nitride on Melted Copper," *Scientific Reports*, vol. 5, pp. 7743 (1-8), 2015.
- [35] K. K. Kim, A. Hsu, X. Jia, S. M. Kim, Y. Shi, M. Hofmann, D. Nezich, J. F. Rodriguez-Nieva, M. Dresselhaus, T. Palacios, and J. Kong, "Synthesis of Monolayer Hexagonal Boron Nitride on Cu Foil Using Chemical Vapor Deposition," *Nano Letters*, vol. 12, pp. 161-166, 2012.
- [36] S. Roth, F. Matsui, T. Greber, and J. Osterwalder, "Chemical Vapor Deposition and Characterization of Aligned and Incommensurate Graphene/Hexagonal Boron Nitride Heterostack on Cu(111)," *Nano Letters*, vol. 13, pp. 2668-2675, 2013.
- [37] Y. Gao, Y. Zhang, P. Chen, Y. Li, M. Liu, T. Gao, D. Ma, Y. Chen, Z. Cheng, X. Qiu, W. Duan, and Z. Liu, "Toward Single-Layer Uniform Hexagonal Boron Nitride-Graphene Patchworks with Zigzag Linking Edges," *Nano Letters*, vol. 13, pp. 3439-3443, 2013.
- [38] N. Guo, J. Wei, L. Fan, Y. Jia, D. Liang, H. Zhu, K. Wang, and D. Wu, "Controllable growth of triangular hexagonal boron nitride domains on copper foils by an improved low-pressure chemical vapor deposition method," *Nanotechnology* vol. 23, pp. 415605(1-6), 2012.
- [39] H. Saleem & et. al., "Two Dimensional Natural Convection Heat Losses from Square Solar Cavity Receiver," *IJCNSNS International Journal of Computer Science and Network Security*, vol. 19, no. 4, 2019.
- [40] M. Y. Channa, A. H. Nizamani, H. Saleem, W. A. Bhutto, A. M. Soomro and M. Y. Soomro, "Surface Ion Trap Designs for Vertical Ion Shuttling," *IJCNSNS International Journal of Computer Science and Network Security*, vol. 19, no. 4, 2019.
- [41] Wu, Chenping, Abdul Majid Soomro, Feipeng Sun, Huachun Wang, Chuan Liu, Xiaodong Yang, Junyong Kang, and Duanjun Cai. "Seven - inch large - size synthesis of monolayer hexagonal BN film by low - pressure CVD," *Physica Status Solidi (b)*, 253, no. 5 pp. 829-833, 2016.
- [42] Park, J.H., Choi, S.H., Zhao, J., Song, S., Yang, W., Kim, S.M., Kim, K.K. and Lee, Y.H., "Thickness-controlled multilayer hexagonal boron nitride film prepared by plasma-enhanced chemical vapor deposition," *Current Applied Physics*, vol. 16(9), pp.1229-1235, 2016.