Human–Drone Interaction: Virtues and Vices in Systemic Perspective

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Abstract. The emergence and use of advanced technologies in today's commerce has gradually grown into habitual practice, and the introduction of more modern weapons including UAVs to military operations is hardly a new challenge in the history of armed conflicts. The interim research results concerning attitudes to drone usage have highlighted a number of contradictions in national and international law and policies and revealed a certain inconsistency in the respondents' attitudes partially caused by the different width of Overton windows devoted to drone expansion in the two countries, as well as by the use of the socio-cognitive tools currently changing the national attitudes and value systems as part of the national mentalities. The research has highlighted a number of contradictions that proved to be more profession-specific, age and gender-specific.

Keywords: UAVs · Commercial use · Warfare · Human factors · Overton windows · International legislation · National regulations

1 Introduction

Twenty-five years ago nobody could imagine that UAVs or drones would enter our lives so tightly. Of course, they are still far from the popularity of mobile phones, but there is no doubt – a real technological revolution is taking place right before our eyes: small and large, flying and crawling, radio-controlled and practically autonomous – all sorts of drones have been entering and influencing human lives.

Today drones have found application in many areas: filmmakers shoot videos from a bird's-eye view, emergency services investigate dangerous terrains, online stores have been gradually replacing couriers with drones, and drone competitions spreading all over the world – e.g. on 28 July 2018 more than 3,000 guests attended Drone Racing League event at BMW Welt, with the entire Drone Racing League series broadcasted every Thursday from 13 September 2018 until mid-December, and the

J. Chen (Ed.): AHFE 2019, AISC 962, pp. 217–229, 2020.
https://doi.org/10.1007/978-3-030-20467-9_20

winner of the race competing against the other 2018 DRL Allianz World Championship Season winners in their final event in Saudi Arabia [1].

Drones revolutionized the nature of both today's commerce and war, becoming one of the most applicable and successful military achievements in the modern history of armaments. As can be seen from the results of the policy of using UAVs by the armed forces of the United States, Israel, France and other countries, the use of drones in the modern world enlarges entrepreneurs' possibilities and buyers' opportunities, and simultaneously increases the risks of respecting the human rights of civilians facing war conflicts, their right to life and safety in particular. However, the practice of both the modern commerce and warfare has changed due to technological innovations, in particular the expanding use and further development of the technology of unmanned aerial vehicles, or drones.

As technology evolves and the use of drones increases, the international legal system should intensify work aimed at restricting the use of these and similar technologies in accordance with human rights obligations, particularly in the framework of International Human Rights Law (IHRL) and International Humanitarian Law (IHL). Yet, national legislations as well as International Law seem to have been far from correlating each other well enough thus expanding Overton windows and perplexing experienced lawyers.

2 Rise of the Drones

By 2025 the development of UAVs can create 100,000 jobs for the US economy and give an economic effect of $82 billion. The research service of Business Insider predicts annual growth rates of 19% in this industry between 2015 and 2020, with the growth of the military expenditure on drones by 5% only. Amazon, Just Eat, Flytrex, UPS, DHL have been practicing cargo delivery by drones, reducing delivery time drastically. In 2017 Dubai tested a Volocopter drone for passenger transportation.

2.1 Commercial Use

The global market for commercial use of unmanned aerial vehicles has exceeded $127 billion, according to the results of a study by PwC. Currently, the most promising industry for the introduction of drone is infrastructure, with the market valued at $45.2 bn, next come agriculture ($32.4 bn) and transport ($13 bn) [2]. However, even here drones raise enormous privacy concerns as they can be easily abused. Therefore, before acquiring drones, two threshold questions should be asked – (1) whether the local community really needs them and whether it has rigid safeguards and accountability mechanisms in place, so that no one uses drones for warrantless mass surveillance.

2.2 Warfare

The increased use of drones for civilian applications has presented many countries with regulatory challenges. Such challenges include the need to ensure that drones are operated safely, without harming public and national security [3]. However, some

researchers indicate that UAVs or drones contributed to the robotization of war. Although they do not belong to the classic robots, since they do not reproduce human activity, experts often rank them as robotic systems. The use of UAVs in various conflicts (Iraq, Afghanistan, Yemen, Somalia, etc.) showed the advantages of the technologies, especially in confronting terrorists.

Yet, the authors share the opinion of Ahmad Qureshi stating that in order to understand the legality of the use of drone strikes, it is relevant to note that Article 2(4) of the UN Charter prohibits the use of force and that Article 51 is the only exemption against such a use of force under the *jus cogens* principles of self-defense under customary international law. Drone strikes, and thereby target killing constitutes an act of war and the use of force can only be justified as self-defence in an actual armed conflict. < … > Furthermore, even if the drone strikes are legal, do not constitute an act of war against any state, and are conducted with the consent of host states, they must follow certain humanitarian law principles [4].

According to V.V. Karyakin, the use of drones "is not yet governed by international humanitarian law, the rules of warfare and the protection of civilians" [5].

3 The Use and Abuse of Drones

Drones are the first cast of the key that opens the Pandora's Box, and if the stakeholders do not take action today, tomorrow the uncontrolled contents of this box, breaking free from it, can destroy humanity. Today is high time to take the necessary steps.

3.1 Both Parties Easily Abused

The military doctrine of the Russian Federation refers the massive use of unmanned aerial and autonomous naval vehicles, guided robotic models of weapons and military equipment to the typical features of modern military conflicts [6]. The US Department of Defense in Unmanned Systems Integrated Roadmap FY2017-2042 states, "Advances in autonomy and robotics have the potential to revolutionize warfighting concepts as a significant force multiplier" [7].

Besides, the new technology now allows perpetrators to stalk and harass victims, as well as avoid restrictions imposed by restraining orders [8]. Yet, in the absence of sound regulations, both parties (not only the military and civilians or criminals and victims) but *humans* and *robotized self-learning items* will be increasingly abused.

3.2 Human Responsibility

Human responsibility for drone use is three-fold. First, it is strategic – people (both the decision makers and the general public representatives as in the future everyone will be concerned) should work out a global strategy for UAVs and other robotized systems development taking into account the need to preserve the present alignment of forces – humans' rule, not robots. Second, it is humanity's self-preservation – not yet the standoff against robots but primarily the protection against the privileged ones making decisions to use drones and discarding possible poorly justified civilian casualties, with

drone operators to face serious consequences for their wrong decisions. Third is the problem of drone privacy as citizens find themselves unprotected from drone intrusion.

4 Research Outline

The undertaken pilot research was aimed at both identifying the ongoing processes in the national legislations of the United States and Russia, which seem to have been experiencing a new round of heightened tension in international relations, and revealing the attitudes of future decision makers – today's Russian university students and their supporters and educators – Russian academics and university managers. The survey was supposed to be conducted simultaneously in Russian and US universities, but the American colleague addressed did not support the idea or even replied to the request.

The research methodology is based upon comparative and systemic approaches to the US and Russian national legal systems in their application to drone usage in such drastically contradicting spheres as commerce and war conflicts and includes analysis of national juridical norms and legal practices, as well as a pilot survey aimed at revealing the attitudes of US and Russian university students to the achievements, failures and prospects of drone application in national and international commerce, as well as the past and ongoing military conflicts, taking into account the previously unseen economic and humanitarian benefits yielded by drone usage, along with the virtualization of drone operators' responsibilities for any possible wrongs.

The research consisted of two parts – one was based on thorough investigation of the current US and Russian legislation and legal discussions, both national and international; while the other was a pilot qualitative research based on a multiple-choice questionnaire.

4.1 Research Goal and Hypotheses

The undertaken pilot research was aimed at both identifying the ongoing processes in the national legislations of the United States and Russia, which seem to have been experiencing a new round of heightened tension in international relations, and revealing the attitudes of the future stakeholders and decision makers as regards to the future development of the Russian Federation – those of todays' students of pedagogy, economics and management.

The survey based on two hypotheses –

Hypothesis 1 – students (people aged under 25) feel freer with innovations and are less cautious concerning their use (UAVs included).
Hypothesis 2 – students (people aged under 25) are more sensitive to decisions taken by single persons (even experts) and not so trustful when it comes to issues that might concern them directly.

The research analysis of the Russian and US legislation and legal and political discourse have identified five challenges facing the growing use of UAVs/drones in the world as both a prominent logistics and warfare tool:

Challenge 1 – Legal: the diversity and inconsistency of national and international legislation have blurred the legal basis for UAVs application, which provides ground for all sorts of improper use and abuse of drones within military conflicts and beyond them.

Challenge 2 – Economic: the economic motives aimed at benefits (profits included) from using UAVs instead of soldiers (who are evidently more vulnerable and quite costly taking into account their training, equipment, supplies, transportation, accommodation, salaries, insurance, hospital treating, pensions, etc.) can surpass and prevail in decisions taken by core stakeholders of leading economies.

Challenge 3 – Political: with UAVs opening new prospects and opportunities in armed conflicts, as well as in all sorts of political conflicts and collisions as both a new means and method of their resolution, they simultaneously turn into both an effective and efficient means of strong political influence, with no country in the world feeling safe enough.

Challenge 4 – Social: practically every society in the world will face a dilemma of looking down on the possibility of unlawful and unjustified civilian casualties in other countries or looking up hoping that drones will never be used to harm them, their families and friends.

Challenge 5 – Organisational: with strong political lobbies, great profits and economic interests of drive manufacturers and the governments of leading economies, the international legislation regulating drones production and application will be kept unchanged as long as possible and organizational difficulties will be used to avoid possible fast solution of the current legal turmoil in regulating the widening use of drones in all spheres including targeted killings inside and outside military conflicts.

4.2 Research Method and Processes

The research methodology was based upon comparative and systemic approaches to the US and Russian national legal systems in their application to drone usage in such drastically contradicting spheres as commerce and war conflicts and includes analysis of national juridical norms and legal practices, as well as a pilot survey aimed at revealing the attitudes of Russian university students, academics and managers to the achievements, failures and prospects of drone application in national and international commerce, as well as in the past and ongoing military conflicts, taking into account the previously unseen economic and humanitarian benefits produced by drone usage, along with the virtualization of drone operators' responsibilities for any possible wrongs.

The designed questionnaire contained 3 background questions and 13 thematic multiple-choice questions intended to identify the general attitude of Russian undergraduate and graduate students and university employees to the drone's employment both in civil and military operations, both inside and outside armed conflicts, as well as opportunities and risks following their predicted and unpredicted potentials.

The participation in the survey was voluntary, which was a delimitation of the pilot research, corresponding to its goal and conditions: the questionnaire was printed out on paper and distributed among students and employees to be collected 20 min later.

4.3 Respondents

Aimed at a pilot research, the sample was limited to 100 respondents – 75 Russian undergraduate and graduate students from one Russian university – Lipetsk State Pedagogical University – and 25 Russian academics and managers from the same university. The random sampling covered over 70 third and fourth-year Bachelor students and first-year Master students, with 57 of them providing valid responses in the questionnaires, and 25 employees of the same university, with 22 of them providing valid responses. Both groups of the respondents took part in the survey in similar research situations. The students returned 71 questionnaires, with 14 of them containing insufficient information for further analysis and the employees returned all the 25 questionnaires, with three of them lacking part of the required information to the extent necessary for further analysis.

The described situation has revealed a problem of either a lack of interest to the research topic or insufficient time length due to the novelty of the topic to both groups of the respondents. As 20% of the respondents have practically fallen out of the research (with their responses being only partly valid and thus discarded by the researchers), the authors intend to interview several representatives from both groups in order to reveal the cause of the problem so that it could be avoided in the future.

5 Research Results

The students' and the employees' responses were not unanimous, which reflects the respondents' voluntary and free expression of their opinions, without any prior preparation or instructions given but the request not to skip questions, express their true attitudes and not exceed the 20 min' time limit. The responses have provided a variety and inconsistency of the Russian students' knowledge of UAVs and their usage, though some of the results have proved to be quite opposite to the expected attitudes of university students and university employees.

5.1 Analysis of the Responses

The survey intended to reveal the primary attitudes, which could be analysed and generalized to serve as basis for further research and did not aim at identifying deep personal reasons of the students' and employees' reactions. Therefore, the questionnaire contained 16 questions – 3 background questions and 13 thematic multiple-choice questions, which yielded the following results considered below.

The background questions aimed at revealing the respondents' age, gender and occupation as this information has revealed their maturity and responsibility for these particular responses, partly explained their attitudes and gave ground for further research of the topic. It is evident from the histograms that most of the respondents are students – under 25 years of age with the standard deviation of about 5 years. The range of the age was found to be 38 years starting from 19 and up to 57 years of age. The data related to the respondents' age are presented in Fig. 1.

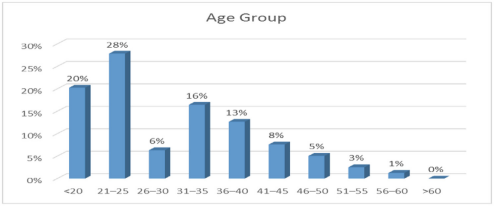

Fig. 1. Age groups

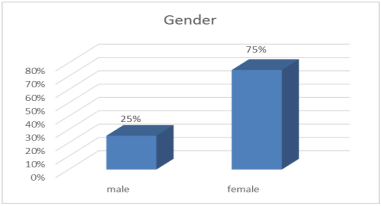

Fig. 2. Respondents' gender

Gender is an important variable in the given research situation which is variably affected by both the socio-economic situation in the country and the research situation in the given university in particular. Hence, though investigated for this study, gender was not further taken into account because of the highly predictable gender situation at the pedagogical university. The data related to gender issues are presented in Fig. 2.

The students' and employees' responses though diversified within each group have reflected more or less uniform attitudes in their responses to Questions 1–5 and Question 8; however, the research hypotheses required comparative analysis of the students' and employees' responses to some questions, which results are discussed in 5.2 below. As is seen in the histogram below, 72% of the respondents were students (57 persons), 14% were academics (11 persons) and 14% were university managers (11 persons). Although all the academics involved conduct research on a more or less

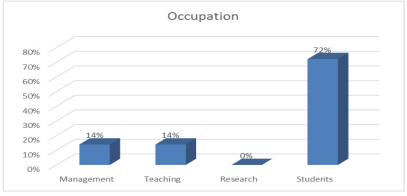

Fig. 3. Occupation

regular basis, their positions are not listed as researchers, so they did not indicate themselves as such, while researchers having no teaching workloads did not take part in the survey. In the absence of big enough separate samples of academics and managers, their responses were combined and analysed in one united sampling. The data are presented in Fig. 3.

Question 1 was intended to identify the general attitude of the respondents to the emergence of UAVs/drones. The responses revealed that 29% of the respondents approved and 8% fully approved the emergence of drones, 6% disapproved and 5% completely disapproved their emergence, with a majority of the respondents (52%) remaining neutral. The neutral majority indicates the respondents' absence of experience in this issue (they have never used or dealt with drones in any way) – see Fig. 4.

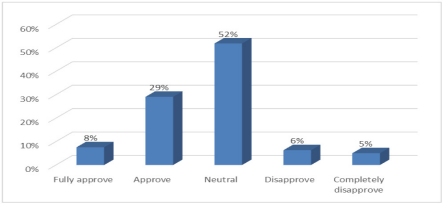

Fig. 4. General attitude to the emergence of drones

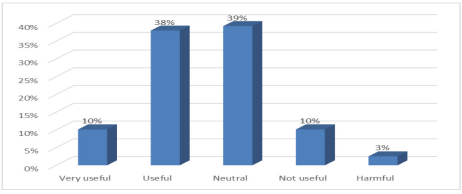

Fig. 5. Assessment of drones as useful/harmful

Question 2 aimed at revealing the respondents' attitude to the usefulness or harmfulness of UAVs/drones. The responses have revealed quite positive attitudes of most of the survey participants, with 10% finding drones very useful, 38% believing in their usefulness, 39% remaining neutral and only 10% considering drones useless, with 3% finding them harmful. It is worth noting that the respondents seeing drones as harmful were in the student group, and (quite unexpectedly) 12% of the students found drones useless against 4% of the employees, which reveals a higher level of professional systemic analysis of the academics and university managers (see Fig. 5).

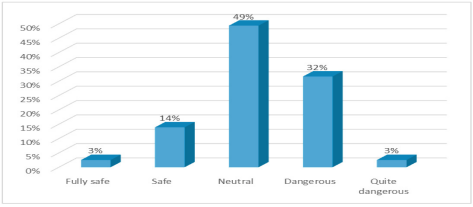

Fig. 6. Assessment of drones as safe/dangerous

Question 3 was supposed to identify the respondents' perception of the safety/danger category. The results have revealed a majority of neutral attitudes, which again must have proved the absence of the respondents' experience and their unwillingness to be involved in any issues concerning drones. The respondents considering drones fully safe (3%) proved to be students, with only 1% of the students finding drones quite dangerous against 4% of employees. 32% of all the respondents are confident about potential danger of drones, with only 14% thinking that they are safe (Fig. 6).

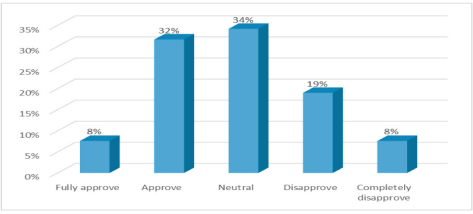

Fig. 7. Dis/Approval of drones applicability in commerce

Question 4 aimed at revealing the respondents' general attitude to the use of UAVs/drones in trade and commerce. Although 34% of the respondents expressed their neutral attitude (mainly due to the limited or no experience), 8% fully approved and 8% fully disapproved the use of drones in logistics. Some students gave full approval (with zero full approval by the employees which reveals their higher level of cautiousness and responsibility), but it was unexpected that 7% of the students fully disapproved the use of drones for commercial purposes (and only 4% of employees), with 15% of the students and 9% of the employees disapproving their use in trade (see Fig. 7).

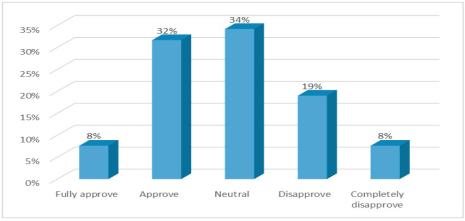

Fig. 8. Dis/Approval of drones use in armed conflicts

Question 5 was intended to find out the respondents' attitudes to the use of UAVs/drones in armed conflicts. The responses showed similar extremes – 8% fully approved and 8% completely disapproved the use of drones in armed conflicts, with 15% of the students and only 9% of the employees fully approving the use of drones in armed conflicts, and 12% of the students and 0% of the employees completely disapproving it. 28% of the students approved the application of drones in armed conflicts against 42% of the employees, which may reflect the employees' deeper emotional involvement in the recent and ongoing armed conflicts (Fig. 8).

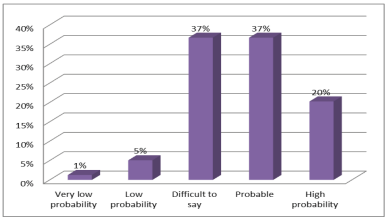

Fig. 9. Probability of drones abuse

The responses to Questions 6–7 and 9–13 are analysed in 5.2 below.

Question 8 was designed for the respondents' assessment of the probability of drones use by terrorists. With 37% of the respondents actually refusing to answer this question (option 'Difficult to say'), 37% expressed their concern for the probability of terrorist attacks with drones and 20% believed that the probability is very high, with only 6% feeling quite safe. Therefore, the majority of the respondents worry about possible abuse of drones (Fig. 9).

5.2 Comparative Results

The responses to Questions 6–7 and 9–13 obtained results, which were worth comparing as they revealed the ongoing political and legal discussions concerning the use of drones inside and outside hostilities and provided deeper understanding of the attitudes of two generations – academics and university managers in charge for the education of tomorrow's decision makers in Russia.

Question 6 was expected to clarify the respondents' attitude to the use of drones in military operations by national armed forces (the Armed Forces of the Russian Federation included). The employees proved to be more involved in the issue (18% neutral only against 33% of the students) and much more positive: 65% approving (against 40% of the students) and 13% fully approving (with 12% of the students), with 4% of disapproving employees with zero complete disapproval (8% of disapproving and 7% of completely disapproving students, which might express their disapproval of Russia's involvement in any armed conflicts).

Question 7 aspired to reveal the respondents' attitudes to the possibility of drones use in peacetime outside armed conflicts by security forces (FSS, CIA, FBI), both Russian and American taken as common examples. The results received were a bit unexpected – 34% of the respondents did not mind, with 32% approving security forces' use of drones and 8% fully approved it, with 19% of disapproval and 8% of complete disapproval. However, the comparative analysis has revealed a higher level of the Russian employees' approval – 51% (against 24% of approving students), with 12% of students completely disapproving against the employees' zero disapproval in this option (see Fig. 10).

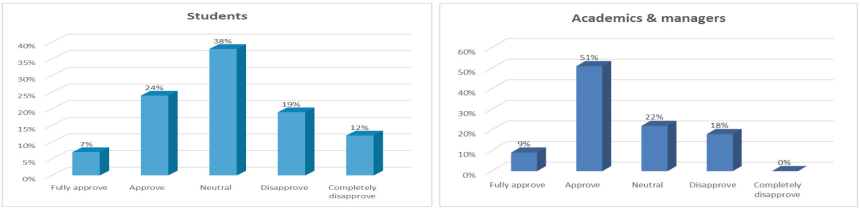

Fig. 10. Attitude to drones use by security forces

Question 9 meant to find the respondents' assessment of the probability of terrorist attacks using drones in peacetime outside armed conflicts. An overwhelming majority of the respondents found this probability real – 42% and even high – 24%, with 24% expressing their unwillingness to answer the question, and 10% of optimists considering the probability to be low (0% – very low). The employees showed deeper involvement – only 9% chose the 'Difficult to say' option against 29% of the students, who did not mostly assess the probability as low (5% against 22% of more optimistic employees – a very unexpected result), with a majority of students and employees assessing high the probability of terrorist attacks using drones in peacetime outside armed conflicts: probable – 38% of the students and 51% of the employees, highly probable – 28% and 18% accordingly.

Question 10 was intended to reveal the respondents' attitude to application of drones as both a new method and means of war. Although 38% of the respondents stated their attitude was neutral, the majority of the responses divided into two – 29% found the new method and means of war inhuman (with large civilian casualties) and less human (4%), while 13% considered them more human and 16% – quite useful (allowing to save soldiers). And here the students demonstrated deeper concern: 33% found the drone use inhuman against 18% of employees (less human – 1% and 9% accordingly), with 33% of the students being neutral against 51% of the employees, with 33% of the students and 22% of the employees expressing positive attitudes to the issue (more human – 14% against 9%, and quite useful – 19% and 13% accordingly).

Question 11 concerned the responsibility for the use of drones in hostilities and showed unanimity of the respondents in the two groups. 42% of the survey participants believed national governments were responsible (38% of the students and 51% of the employees), 30% put the responsibility on commanders-in-chief (31% and 27% accordingly), 13% found responsible commanders of operations (commanders on site) – 14% and 9% accordingly, and 14% considered drone operators fully responsible for the drone attacks (16% and 13% accordingly). The option 'Manufacturing corporations' was only chosen by 1% of the survey participants (1% of the students with 0% of the employees). These results have proved the need for more elaborated national and international legislation as seen by the surveyed Russian citizens.

Question 12 proposed to reveal the respondents' attitudes to the responsibility of drone operators for civilian casualties and yielded the following results: though 27% of the respondents chose the 'Neutral' option, an overwhelming majority believed that drone operators were responsible (34%) and fully responsible (30%) for civilian casualties, with 5% only believing in the low responsibility and 4% finding them not responsible. The compared results of the two groups turned out to be quite unexpected and very interesting for further research: an overwhelming majority of the respondents in both groups found drone operators responsible for civilian casualties: highly responsible – 31% of the students and 40% of the employees and fully responsible – 33% of the students and 29% of the employees, with 29% of the students and 18% of the employees preferring the 'Neutral' option. It was quite unexpected that 13% of the employees exempted drone operators of any responsibility (with 0% of the students), while 0% of the employees and 7% of the students chose the 'Low responsibility' option.

Question 13 aspired to highlight the respondents' understanding of the level at which decisions on the use of drones in military operations should be made. A majority (40%) considered the level of national governments to be the most appropriate one, 23% believed it was the level of international organisations (e.g. UNO), 12% chose the 'International Law' option, and 19% thought it was the level of commanders of military operations, with only 6% choosing military organisations (like NATO), which might have revealed the purely Russian understanding and attitude to this organisation, which has been constantly depicted as hostile to the Soviet and Russian national interests. The results of the two groups proved to be very close, with 42% of the students and 34% of the employees voting for national governments, 21% and 22% accordingly – for commanders of the military operations, 22% and 22% choosing international organisations, and 6% and 4% accordingly distrusting military organisations (e.g. NATO). As regards to the 'International Law' option, it was preferred by 18% of the employees and 9% of the students only, which most probably reflects the different level of education of the respondents in the two groups (in the absence of law students and teachers).

6 Conclusions and Discussion

The results of the legislation and discourse analysis supported by the survey findings have highlighted a scope of problems proving the correctness of the previously formulated economic, social, political, legal and organisational challenges facing the drone use and possible abuse of both UAVs and humans. Hypothesis 1 has been proved partly as the students participating in the survey have expressed a high enough level of cautiousness – very probably because they were mainly females. Hypothesis 2 has been proved, though the employees have also showed a high level of sensitivity to decisions taken by single persons (even experts) and a high enough level of distrust, which again might be explained by a majority of females in the employees' group.

The five challenges revealed above, facing the growing use of drones as both a prominent means of commerce and warfare and the results of the survey involving Russian students and university employees as stakeholders of Russia's policies future development, have prompted five priority issues highlighting the primary steps to be taken to resolve the existing problems in legal, political and organisational regulations of drone use in the present and future both in peacetime and armed conflicts.

Priority issue 1: The need for a comprehensive review of the current legal basis (both national and international) for drone application in commerce and warfare in order to pinpoint contradictions and inconsistencies and reveal possibilities for misuse and abuse of drones as means and methods of war and commerce (e.g. logistics).

Priority issue 2: The need for national and international changes to be introduced to the legal basis for the development of economic use of drones – at the level of WTO and other international organisations (ITC, ECO, WHO, AITIC, FAO, etc.) for the economic development and prosperity of the world to the fullest.

Priority issue 3: The need for deeper political involvement of all the drone stakeholders (80 countries) in order to prevent future clashes of economic and political interests and the use (and abuse) of drones as means and method of their resolution.

Priority issue 4: The need for the drone stakeholders/decision-makers uniting their efforts on international forums (like UNO, UNESCO) in order to reach a higher level of social stability and safety inside their societies and beyond them.

Priority issue 5: The need for International Law, IHRL and IHL reconsidered and amended to the necessary extent under the new conditions, to regulate the core terms of drone's production, sale and application at the global level and take the necessary organizational measures in order to reach global consensus as soon as possible.

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