Conceptualizing lethal autonomous weapon systems and their impact on the conduct of war

A study on the incentives, implementation and implications of weapons independent of human control

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Abstract

The thesis has aimed to study the emergence of a new weapons technology, also known as ‘killer robots’ or lethal autonomous weapon system. It seeks to answer what factors drive the development and deployment of this weapon system without ‘meaningful human control’, a component that allows the decision to kill to be delegated to the machines. The research question focuses on seeking the motivations to develop and deploy LAWS, as well as the consequences this would have on military conduct and conflict characteristics.

The incentives they bring up and the way of adopting them has been studied by synthesizing antinomic democratic peace theory and adoption capacity theory respectively. The findings of this qualitative content analysis lead to two major conclusions. (1) That LAWS present severe risk avoidance and costs reduction potential for the user. These factors have a more prevalent pull on democracies than autocracies, since they stand to benefit from LAWS’ specific capabilities more in comparison. (2) That their adoption is aided by low financial intensity needed to adopt it, due to the high commercial profitability and applicability of AI technology, and the ease of a spillover to military sphere. Their adoption is hindered by high organizational capital needed to implement the drastic changes LAWS bring.

All of this leads to the prediction that LAWS are likely to proliferate further, at a medium speed, and potentially upset the balance of power.

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lethal autonomous weapon systems, LAWS, autonomy, technology, security, war, ethics, arms control, proliferation, democratic peace theory, adaption capacity theory, diffusion, meaningful human control, killer robots

List of Abbreviations

ACT	Adoption Capacity Theory
AI	Artificial Intelligence
CSKR	Campaign to Stop Killer Robots
DOD	Department of Defense (United States of America)
EIU	Economist Intelligence Unit
etc.	etcetera
EU	European Union
HRW	Human Rights Watch
i.e.	“id est” (latin) / in other words
ICRAC	International Committee for Robot Arms Control
ICRC	International Committee of the Red Cross
IISS	International Institute for Strategic Studies
IR	International Relations
LAWS	Lethal autonomous weapon system
n/a	not available / applicable
NATO	North Atlantic Treaty Organization
R&D	Research and development
RQ	Research question
SIPRI	Stockholm International Peace Research Institute
UAV	Unmanned aerial vehicle
UN	United Nations
UNIDIR	United Nations Institute for Disarmament Research
US/USA	United States / of America

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1. Introduction

In recent years, artificial intelligence (AI) has increasingly claimed the spotlight of both, the public interest, and that of academia in numerous different fields, amongst them IR. Lethal autonomous weapons systems (LAWS) have since been hailed as the third revolution of warfare, after the ones of gunpowder and nuclear weapons (Future of Life institute 2015). A common definition for them is "a weapon that, once activated, can select and engage targets without further intervention by a human operator" which provides for a multitude of issues and upheavals, and those will be the subject of this thesis (DOD 2012).

Often, in academic and popular publications, LAWS are referred to as "killer robots", implying a future tense, akin to science fiction. Nevertheless, a recent report by the Stockholm International Peace Research Institute (SIPRI) has identified 49 lethal autonomous weapon systems which are already deployed by several militaries, emphasizing that killer robots are no longer science fiction, but reality. These 49 cases are considered to have full "autonomous target recognition" capabilities and therefore, at the very least, the optional setting of not having a human involved in making lethal decisions (Boulanin, Verbruggen 2017:26). This constitutes the revolutionary characteristic of these new weapon systems and warrants the academic interest of this thesis. Additionally, major organizations and NGOs in the field, amongst others, Human Rights Watch, the International Committee of the Red Cross, and the United Nations have all published on the issue, highlighting their importance, and thus justifying further scholarly attention (HRW 2016, 2014; ICRC 2016, 2014; UNIDIR 2014; Future of Life institute 2015).

Considering this, a study on numerous aspects of LAWS's effect on war, reaching beyond just the military sphere to questions of their (non) proliferation and, the potential for a LAWS arms race, and LAWS's incentives and implementation, is attempted by this thesis. By focusing on war, weapons, and the changes in their respective uses, regardless of actors, this topic is inherently one of IR relevance. Henceforth, the research question (RQ) is;

What motivate actors to deploy LAWS in conflict, and how would their use change the conduct of the military using them, and the characteristics of the conflict they would be involved in?

For this question to be answered, the advantages LAWS provide over conventional, human-operated weapons systems must be determined, and considerations about their operational and financial requirements made to find an answer. To achieve this, this thesis will use two theories,

corresponding to the two parts of the RQ and use them on the empirical information available and scholarly research conducted on AI and LAWS in the form of a qualitative content analysis.

Each theory promises to provide insights into the two key areas necessary to study for the RQ to be answered, one being *why* the existence of LAWS might incentivize their use, and the other being *how* they are used and implemented. Hence, the first theory is 'democratic peace theory', which theorizes that democracies engage less in armed conflict than non-democracies, from which reasons or the incentives for LAWS' use may be deduced. The second is 'adoption capacity theory', which delves into how military innovations are implemented and subsequently diffused, and what factors influence said process.

The literature review will give an overview over the research thus far conducted, the relevant concepts their utilize and implications for this thesis' effort they pose. Followed by a method chapter in which a qualitative content analysis is argued for. Lastly the thesis will consist of two analysis chapters, further research considerations and implications of the findings.

2. Literature review and theoretical framework

This literature review introduces scholarly work that has been produced on LAWS and the issues connected to them, and by extension, with their predecessors: drones.

Most of the academic work in this field does not use an IR theory, rather, the majority focuses on ethics and international humanitarian law. Although this is an exercise this thesis does not intent to contribute to directly, the discussion, nevertheless, includes relevant concepts. The forthcoming sections will elaborate on these and introduce two theories which this thesis utilizes to answer the aforementioned RQ. The theory section will include an argument for their relevance for the topic and their applicability to LAWS. This is followed by a section introducing the empirical material of LAWS. Lastly, the literature review will conclude with a summary of the literature body, as well as a categorization and evaluation of their chosen methodology.

2.1. From drones to LAWS

Drones are a relatively new military technology and the precursor to LAWS. However, one can trace it back further, technology such as guided torpedoes had developed and deployed since the 20th century (Geist 2016: 318; Asaro 2017: 142). As such, the evolution from guided munition to drones may be comparable to that of a plane to an aircraft carrier, in which the

newest feature is not the plane, but a new means of their combined usage, further allowing for new capabilities which each on their own is not capable of. This enabling of new capabilities is also a key facet of LAWS, as will become clear in the analysis. Risk aversion, as an example of one of these facets, could be an issue or benefit, depending on one's position in favor or against drones, long before LAWS became an object of interest (Boyle 2015: 122).

While the focus of this thesis lies on LAWS and not drones, the general literature body emphasizes most often their ethical and legal concerns that have arisen with the increased profile of LAWS, which are built upon the same issues arising with drones. Subsequently, literature on LAWS can be categorized into two groups within that context.

The first covers the debate advocating for or against LAWS, in which most scholars arguing against LAWS' use either ethical or legal grounds, or a combination of both. Meanwhile, their opponents argue that LAWS would turn war into being more compliant with international (humanitarian) law (Arkin 2010; Anderson, Waxman 2013). This is a direct continuation on the same debate regarding drones, where the ability to strike surgically against key targets, labeled decapitation strikes, is weighted against collateral (civilian) damage that may further entail "depersonalization of killing" (Korać 2018). This argument is similar to many scholars opposing any machine (no matter if drone or LAWS) be given the ability to kill a human, because that "relieve[s] human soldiers of the psychological burden" and thereby facilitate a lowered inhibition to kill and start or join armed conflict in general (Korać 2018: 62). The argument here echoes that machines only treat human life as an "objects" and that killing humans then denies a normative and inherent human dignity (Johnson, Axinn 2013).

The second group of literature diverges from the aforementioned approach. Edward Geist, for example, argues scholarly attention should move away from positively or negatively evaluating LAWS towards understanding the broader effect of their use (2016). There is a recurring concern that AI technology is not containable via regulation and thus makes non-proliferation of this technology difficult, if not impossible (Geist 2016). This, some scholars claim, is due to the dual-use nature (civilian and military) of AI technology applications, meaning that a spillover in each direction is increasing and easing its proliferation (Schulzke 2016: 15; Cummings 2017). Proliferation is of concern because it determines whether decision-makers face an adversary in the form of LAWS or one in possession of them. For this technology to have a widespread and impact as the term 'revolution' suggest, it has to proliferate which would fundamentally alter a situation.

Another approach to study LAWS within this area is to examine the AI variants and their capabilities, distinguishing between "narrow" and "general AI", and what each might enable in

practical and operational consequences, on a tactical and strategic level (Ayoub, Payne 2016: 794). A general AI is what is known under the term from science fiction, a 'true' artificial intelligence. These do not exist and are still quiet some distance away, although their invention would be truly groundbreaking and effect every domain of humanity (Cellan-Jones 2014). A critique leveled against those that claim that AI could make war more "just" is based on that a general AI would be needed for a machine to understand any meaning or value of a human life and thus be "just" (Arkin 2010; Ayoub, Payne 2016: 795). A narrow AI on the other hand, has "expertise in a particular domain, and are able to learn through practice to improve their performance", which is what is described as machine learning and will have vast implications in the analysis (Ayoub, Payne 2016: 795).

The second group is broadly the literature body this thesis intends to contribute to, since it is much less developed and smaller in scope than the work touching on the ethics and philosophical issues, and thus represents a gap which deserves further attention.

To move back to the first group about the ethical and legal problems LAWS pose and their compliance with international law, who represent the most common approach to the study of LAWS (Amoroso, Tamburrini 2018; Maas 2019: 2-3). Broadly, they conduct discourse analysis and are constantly citing each other in an ongoing, fluid debate, which is reflective of the concept of intertextuality in discourse analysis (Fairclough 2003:41).

At the center of this literature is the emphasis on the fact that LAWS's deployment represents the deliberate transfer of the decision-making power to kill from a human being to a machine (ICRC 2018). While the decision power to execute lethal measures is still held by human beings, it is under "meaning human control", and this limit to human involvement in decision-making is the defining characteristic of LAWS. This phenomenon is described as human-in/out/on-the-loop showing the different levels of human involvement into decision-making (HRW 2012: 2). The absence of meaningful human control is almost universally recognized as the main source of the issues arising from LAWS (Sauer 2016).

Moreover, accountability over LAWS's actions is contested and ambiguous, for instance, who would be to blame if a LAWS kill a civilian? Robert Sparrow has argued that no-one can be held accountable for such errors as the machine made such a decision autonomously. He discusses three different actors who could potentially be considered responsible, the programmer, manufacturer of the LAWS, the commander in charge and the LAWS itself. He then concludes that none of them are prosecutable (2007; Sauer, Schörnig 2012:375). The opposing side argues that a human is just as autonomous as a LAWS (Schulzke 2013:204). Henceforth, Sparrows' argument collapses on itself once LAWS are replaced by humans and

the outcome, presumably, stays the same. Specifically, the method of researching the accountability problem is by a qualitative, small-n comparative study.

Finally, there is LAWS's compliance with international humanitarian law (IHL). Their use can be judged by whether they breach the principles of distinction (between combatants and civilians) and proportionality (damage vis-à-vis purpose of attack) (Asaro 2017:142). These would influence any decision on their use and even if it would do so differently based on the actor, it is still a relevant discussion for the RQ. For example, certain munition types violate the principle of proportionality and others, such as landmines that of distinction. While nuclear and chemical weapons and arguably LAWS, violate both (Amoroso, Tamburrini 2018:5-6). However, there are instances where the proponents of LAWS argue that they could be designed to be incapable of breaching said principles, in ways humans cannot, and thus making LAWS more appropriate to use for armed conflict (Arkin, 2010: Anderson, Waxman 2013).

2.2. Theoretical framework

For the RQ, why LAWS are used and how is at the center, therefore this thesis has chosen the following two theories to study them. By adding LAWS' capabilities to a states' military, the explanations, limitations and implications given by democratic peace theory for the decision to engage in armed conflict, changes. Horowitz's adoption capacity theory theorizes about how militaries adopted military innovations and what consequences that would lead to, therefore motivating the choice to utilize it in this thesis. The advantages LAWS pose over conventional weapons may both, create new problems and solve old ones. These then may be linked to the incentives LAWS exercise (Sauer, Schörnig 2012). LAWS use potentially may create a security dilemma, as they may or may not provide the user with some extent of a first-mover advantage, which then may alter the balance of power. This is the area where adoption capacity theory (ACT) can grant insight into the consequences of LAWS's usage (Horowitz 2018:39).

In the following sections, the two theories are introduced and examined in detail.

2.2.1. Democratic peace theory and its antinomic variant

Democratic peace theory has become a cornerstone of conflict and IR studies, so much so that Jack Levy named it "as close as anything we have to an empirical law in international relations" (1988: 662). Its core theoretical insight is that democracies do not fight wars against one another, due to accountability to their electorates and ideological similarities to one another. Scholars such as Michael Doyle have since made broad characterization of the governing systems of democracies as more "peace prone", and consequently, autocracies as more "war

prone" (1995:180). Evidently, democratic peace theory has received a lot of scholarly attention since it touches on the core of IR, matters of war and peace, and subsequently leads to a debate on whether the spread of democracy will also spread peace (Reiter, Stam 2002; Yildirim, Sezgin 2005:99). Sauer & Schörnig, for example, argue that LAWS and drones make democracies more bellicose against non-democracies. Because the same incentives which keep democracies from engaging in war, that of having to safeguard their own soldiers' life and their military expenditure through political accountability, are possibly negated and undermined by LAWS (2012:365).

This argument is mirrored by Kaag & Kreps who argue that drones have such an effect as to "insulate citizen[s]" from wars and hence weaken or even neutralized the democratic electorate's influence and with it political accountability on such issues (2013: 107).

Here, one must also consider the change in wars in recent history, moving away from inter-state conflict and towards "asymmetrical warfare", this point becomes much more potent, as countries increasingly move to use airstrikes and actively keeping military personnel out of danger whenever possible (Thornton 2007; Kaag, Kreps 2013: 106). Even though democracies do not tend to wage war against other democracies, the inherent conclusion that democracies are therefore more peaceful does not hold up. They have engaged in several conflicts against none-state actors or supported non-state actors against another state actor as several examples and proxy wars show in the Middle East (Marshall 2016). Democracies have historically also been an initiator for armed conflicts, which seems to contradict their "peace-prone" nature (Doyle 1995: 180).

This is the "bifurcation" of the theory which seemingly would result in "democracies keep[ing the] peace with each other while being as warlike as any other kind of state" (Müller 2014: 494). It is worthwhile to clearly define bifurcation, it is the splitting up of one into two branches. In this context, it refers to the splitting of the democratic peace theory into one branch that supports democracy's tendencies to be peaceful, and another that supports democracy's tendencies to be bellicose. With reference to the second branch, it is important to define 'antinomic' as well. Harald Müller describes antinomy as "a lawlike proposition from which a secondary proposition and its very opposite can be deduced" (2004:516). These dual findings are reflective of a challenge that antinomic democratic peace theory poses against its 'traditional' variant, despite or perhaps because of both branches using the same starting point to be applied with, with entirely opposite results. Sauer & Schörnig describe this as democracies having distinct and inherent tendencies to act simultaneously in a peaceful, conflict avoiding

manner, as well as in a bellicose, violent prone way, just directed at different target types (2012: 366).

But how do autocracies relate in this context? Antinomic democratic peace theory touches upon a democracy's relationship with war and what influences its decision-making. The institutions in place in democracies can be described as mere vehicles to deliver a majority will into executing a decision, as such they are "transmission belts" (Müller 2004: 503/501). If a majority of constituents wants their government to engage in war, the democratic institutions are to be expected to translate that wish.

This warrants greater attention towards the effects LAWS might have on an electorate. In contrast, in autocracies there is no will to be translated, making the process much simpler. But, the change of risks and costs calculations induced by LAWS applies just as much to an autocracy as it does to a democracy. How exactly LAWS impact these will be followed up upon in the analysis of this thesis.

Now, after having set up the framework of democratic peace theory and its traditional and antinomic variant, it becomes apparent how LAWS fit into the theory framework and how the theory can aid with answering the RQ. LAWS represent a new variable, a new technology to alter the tendencies and incentives democracies have in favor or against the use of violence and engaging in armed conflicts.

One of the factors influencing the use of LAWS in war, is risks, for the lives of military personnel engaging in hostilities. To avoid taking these risks, democracies adopt what Shaw labeled "risk transfer rules", which most importantly entails the minimization of casualties as the highest priority that militaries should work towards, without sacrificing any of their capabilities (2005). In democracies, more than in any other form of government, high fatalities lead to a public backlash and a withdrawal of support for their government's involvement in the armed conflict. Thus, when the public starts exerting their influence through the institutions set up to do so, support for the government can be put in serious jeopardy. Therefore, policies and actions which avoid casualties at almost all costs are incentives by virtue of type of government (Sauer, Schörnig 2012: 367; Luttwak 1997).

These risk calculations can also be extended beyond one's own armed forces to civilians on the other side of an armed conflict via the International Humanitarian Law. The risk of causing "collateral damage", that is the killing of an "enemy's innocent civilian population", may have an influence on an electorate too (Kaag, Kreps 2013: 105). From the perspective of a military, such requirements can only be considered a restriction and a limitation to their task of following their government's orders. The answer is the development of technologies which directly

address these limitations, and this factor this will be followed up upon in the analysis (Kaag, Kreps 2013: 97-98).

Another factor is cost reduction. One could imagine this in two ways, one is the costs in lives and the other is the cost in money. Several quantitative studies substantiate that higher degrees of democracy leads to lowered military spending during peace (Fordham, Walker 2005; Yildirim, Sezgin, 2005). This ties in with what constitutes LAWS and drones' attractiveness to any actor, not exclusively democracies, because they represent a way to reduce costs in both possible forms simultaneously (Fordham, Walker, 2005:142-145).

2.2.2. Adoption capacity theory

The second theory this thesis will employ is adoption capacity theory, which provides a framework for how an institution (militaries) can implement and use a new military technological innovation (LAWS) into existing organizational procedures (Horowitz 2018:43). It further encompasses the realist concepts of security dilemmas and balance of power, as to how they are impacted by the introduction of such new military technology.

A misconception about military innovations is that their invention and subsequent availability to the innovator grants them an instant advantage over those who do not have it. Nuclear weapons are such a case. However, Horowitz in the context of his book "The Diffusion of Military Power" suggests otherwise, in that "inventing technologies or even being the first to use them does not guarantee advantages" (2010: 1/2). ACT instead provides a framework to determine when and how major military innovations, a classification LAWS would indubitably qualify for, change the status quo. To operationalize the theory, one must first define the concept of diffusion, a prerequisite concept for this theory. Rogers has defined it as "the process by which an innovation is communicated through certain channels over time among the members of a social system." (2003, 11). This needs an identifiable starting point, a "demonstration point", after which diffusion can begin (Horowitz 2010: 8). At what point one has occurred for LAWS, remains to be determined in this thesis' analysis. It can be identified once the "potential of its full capabilities is reasonably known in the international system through an action by a first mover, rather than the capability merely being the subject of internal exercises or debates" (Horowitz 2010:24).

Moving on to the core of ACT one must distinguish between the introduction of a new major military innovation, and their integration into military structures. Something which can be easily conflated but are in fact two steps occurring consecutively. To explain this process,

ACT has two key variables, organizational capital and financial intensity, both of which are required at different levels to adopt an innovation (Horowitz 2010: 9).

Organizational capital is defined by the flexibility of a given organization to change its existing and routinized processes to adapt to a new input. This can be higher or lower on a spectrum, as bureaucratic structures of an organization can influence and veto changes to itself. Horowitz refers to these as "veto points" and the more there are of them, the lower the organizational capital (Horowitz 2010: 38). Henceforth, a high level of organizational capital would hinder the adoption process and vice versa.

Organizational capital is measured along the following guidelines. The first of which is the age of a given organization, the older it is, the higher the likelihood of entrenched allocations of reputation and funds, and thus the higher the resistance to changing them. Second, the willingness and extent of investment into research and development (R&D) and experimentation, combined with existing capabilities. Third, the self-identification, hence the purpose of the organization as perceived by itself. If this is a very narrow one, this indicates resistance to adopting innovations as it would challenge their narrow definition (Horowitz 2010: 39).

Financial intensity allows this thesis to use quantitative data for the analysis, but one must make a distinction between the two spheres of financial intensity. The driving force of a new military innovation can originate from a civilian technology. Alternatively, innovation can be driven by military consideration and the innovation thus has exclusively military applications (Horowitz 2010: 32). Where and how LAWS fit into these two categorizations will be followed up in the analysis. But generally, commercial technologies require less financial capital than military ones, since a market-based competition creates an incentive for private companies to pay part of development costs to allow them to collect a return on their investment. While the same technology may simultaneously be used separately in the military (Horowitz 2010: 32).

Because of the absence of any financial return on investment, the costs are considerably higher and usually entirely paid for by public funds, for which the return is not measured monetarily but in capabilities (Horowitz 2010: 31).

Organizational capital and financial intensity are thus factors which inform the diffusion of a new technology the system level. To summarize, the greater the financial intensity of an innovation to be implemented, the slower the spread of it through the system and the likelihood of an actor deciding to pursue adoption. Mirroring this is organizational capital, the higher it is slower the implementation of an innovation proceeds and the slower its spread (Horowitz 2010: 32/39).

Lastly, ACT partials informs why a state wants to adopt a new technology. Even though the theory itself only deals in how that may be done, the findings allow further reaching conclusions. State's motivations can include a sense of strategic necessity, in a context of an arms race with a rival entity, or the sheer demonstration of X technology as a new norm in military practices. Here, a strategy to respond to an adversary gaining an advantage is to form an alliance with a third party as a balancing act, a fact that briefly touches upon realism (Horowitz 2010: 28/29).

Speaking further on the motivations for adoption, having a technology before others implies granting the innovator a "first mover advantage". This is equivalent to being in possession of a monopoly. Gaining such a first mover advantage would be "inversely proportional to the diffusion rate of the innovation" and the more this technology proliferates the weaker such an advantage gets (Horowitz 2010: 49).

2.3. Empirical material

There is a substantial amount of non-academic material of relevance and this section aims to introduce an objective description of the magnitude of LAWS in existence and the ones in development. This would give shape to the LAWS's R&D status quo around the world, while focusing on countries which have data publicly available over those who do not.

The most advanced actor and investor in LAWS technology is the United States of America (USA). As for the year of 2015, its Department of Defence (DoD) spent $149 million on LAWS's R&D (Bornstein 2015). $18 billion are pledged by the DoD for the same purpose to be invested continuously for the time period from 2016-2020 (Hunter 2017: 11). For the fiscal year of 2017, the DoD has invested $4 billion and 245 million (DOD 2017: 3). This showcases that LAWS are taken seriously by the USA'S military, also judging by the increase in their official spending in this area 28x fold in the timespan of two years. Even though unmanned does not directly mean autonomous, the terms are not mutually exclusive, a report for "unmanned systems roadmap" by the DoD stated that "the ultimate goal is to replace the operators with a mechanical facsimile [of] equal or superior thinking speed, memory capacity, and responses gained from training and experience", thereby showing a definite relationship between unmanned and autonomy (DoD 2007: 53/54).

Outside the DoD, the US government also supports civilian projects of autonomy and artificial intelligence. Here, its investments in AI technology in 2015 reached approximately $1,1 billion in unclassified R&D (NSTC 2016: 6). If one now considers this number reaching the billion mark, and then was followed by pledges for military R&D increasing to 18 billion

the next year, it is a clear assumption to make that the highest funded military on the planet sees vast potential in LAWS technology.

Some examples of LAWS follow, the US Navy has successfully tested an autonomous ship, the "Sea Hunter" at a price of $2 million apiece (Scharre 2018: 78). Other projects, also by the US Navy, include a "Low-Cost UAV Swarming Technology" or LOCUST (Smalley 2015), or the "Perdix micro drones", which, according to the DoD, has tested capabilities like "advanced swarm behaviors such as collective decision-making [and] adaptive formation flying" (DOD 2017; Lachow 2017: 97). Lastly, the X-47B drone, managed to conduct an autonomous aircraft carrier landing and aerial refuelling (Altmann und Sauer 2017: 122/123).

Moreover, Russia conceives military robotics as a key priority area for Russia's "new rearmament programme", which reportedly has a budget of about $346 billion for the time period of 2016 to 2025 (Boulanin, Verbruggen 2017: 98). Specifically, how much of that sum is allocated for LAWS related R&D is undisclosed. However, there is information that shows that the funding is used for LAWS development. The "Uran-9", which is essentially an autonomous tank with contemporary weaponry of a manned and armed tank but lacking both of those characteristics. Or the T-14 Armata, which is still manned but explicitly has the option of not being so in the future according to its manufacturer and for which purpose it has partially been automated (Scharre 2018: 114/115).

Moving on to Europe, the larger European Union (EU) member states have acknowledged autonomy and AI as key strategic areas to be supported and subsidised. The EU itself has the European Defence Fund with €13 billion for 2021-2027 and previously spend €665 million on AI and robotics in the last decade (EPP 2019; Boulanin, Verbruggen 2017: 103). The French government has stated similar intentions with the creation of a €550 million fund to support AI development (French government 2017). The Italian government has a less clear focus on AI but its "Industria 4.0" plan nevertheless includes "autonomous cooperative robotics and sensors", denominated with €30 billion for 2017-2020 (Italy Ministry of Economic Development 2017). Notably absent from this list is Germany, which has not yet made any mention of autonomy or AI in official plans, despite possessing weaponry identified as being capable of autonomous engagement (Boulanin, Verbruggen 2017: Table A).

Israel does not have any official mention of strategy or funding into LAWS, however, despite this, they are one of the leading exporters of unmanned weapon systems on all areas of operation (land, sea, air) (Boulanin, Verbruggen 2017: 100). One standout example is the "Harpy", which has the officially acknowledged capability to operate within human-off-the-loop conditions and can identify, track, and attack targets autonomously once launched and has

reportedly been used in action in Armenia (Scharre 2018: 5; Boulanin, Verbruggen 2017: 54). Israel, together with South Korea, also pioneered autonomous sentinel weapon systems designed to protect their respective borders (Weitz 2013: 4).

China declared AI and robotics as key priorities for government supported R&D in 2014 and has numerous plans in place that specifically mentioning it, although, again, no denomination of funding is given (Cheung, Anderson, Yang 2017: 2). Reportedly, they have been working on autonomous submarines, although no specific capabilities or official statements are known to the public concerning LAWS (Chen 2018). But considering China's position as second-ranked in overall military expenditure of $250 billion annually (accounting for 14% of global defense spending) in 2018, it is reasonable to assume that significant assets are being invested in dual use civilian and military AI R&D (Ray 2016; SIPRI 2019).

2.4. Summary and methodological considerations

The cited literature concerning democratic peace theory constitutes a theory consuming exercise by means of introducing a new variable (LAWS) into an established, theoretical framework. This approach has been utilized by Sauer & Schörnig on LAWS and Kraag & Kreps on drones and proven to be insightful (2012; 2013). In contrast, Horowitz's book on diffusion of military power, containing ACT, is a deductive theory development process, as he observes several historical phenomena and constructs a new theory on their basis.

Henceforth, this thesis aims to both, expand on the theory with additional research and data which has since appeared until now, and also combine it with the insights of ACT, to arrive at a more comprehensive understanding of LAWS and to answer the RQ.

The other literature reviewed utilizes a wider range of methodological tools, with the most prominent one being discourse analysis within the ethical and legal issues of LAWS. Another method used is the historical approach, which has been utilized to describe military innovation by Horowitz and others, particularly on drones. However, it is difficult to use this in the case of LAWS, simply because there is not yet a comprehensive and long enough history of LAWS' R&D and their deployment to be analyzed, and the current secretive nature of the topic makes such an approach unfeasible.

Finally, a bit of a standout in the approach of the study of LAWS is from the angle of AI and computer science to identify different kinds of AI (general or narrow), and conclude, based on their findings, on their specific military applications. However, using the technicalities of computer science is not an approach replicable for an IR study.

3. Methodology

The following sections describe and justify the method of this thesis. It is based on reviewing the methodologies, theories and concepts used by other scholars. Furthermore, it will determine and argue for which primary and secondary data to use and examines the trustworthiness of the data and its origins. Lastly, a section will explore this method's limitations, reliability, and validity.

3.1. Connecting theory, data and method

I argue that an answer to this thesis' RQ can be reached by operationalizing antinomic democratic peace theory and ACT. While the former theory addresses the *why* (incentives) aspect of the change LAWS brings, the latter theory will allow conclusions as to *how* (implementation) their adoption is playing out in practice. These refer to the incentives and implementation questions of the RQ and the thesis' title.

Hereafter, this section will outline how the theories, the data they have been applied to, and the method used to do so are connected.

Within this theoretical framework of the two theories, this thesis produces a qualitative content analysis on two consecutive counts. Each of these is structured around the use of the two theories.

Antinomic democratic peace theory has been demonstrated as a theoretical tool to understand the behavior of democracies vis-à-vis autocracies and one another. Hence, it allows for insights into different dyadic pairs of actors engaging in conflict and lead to explanations for why they do so.

ACT is a means to understand how an organization adopts an innovation (LAWS) which requires the operationalization of two major variables, one of which is financial intensity, which includes quantitative data in the form of funds for AI and defense related R&D.

The first step hereafter is to identify the data needed and whether these are primary and/or secondary sources. The analysis requires political statements of politicians and reports of institutions, which entail a positive, negative or neutral position on human control of the lethal decision-making (human-in-the-loop question). This is qualitative primary data. The aim is to find and subsequently codify a theme, which must accommodate an expressed opinion on where humans should be placed, according to the authoring actor, in, on, or out of the loop of lethal decision-making. Examples for such primary sources are political statements, official strategies for military and economic matters, reports of government agencies, parliaments, and reputable

NGOs and thinktanks. Another set of primary data is the quantitative spending information on AI and LAWS needed for the financial intensity variable within ACT.

Secondary data used for the qualitative content analysis are academic articles which identify and discuss ethical, legal and practical issues with LAWS. They touch upon who to hold accountable for LAWS, their compliance with humanitarian law principles of distinction and of proportionality, their ease or lack thereof to proliferate, amongst others to be critically analyzed in their own sections in the analysis' chapters.

The theme to be identified, categorized, and subsequently analyzed is that of clearly defined issues, directly caused by the emergence and usage of LAWS in armed conflict. These issues, once identified, point to a thereto connected incentives for their use. For example, the depersonalization of killing allows for physically removing the risk for military personnel and therefore informs an incentive for risk aversion (Korać 2018).

In other words, a systematically conducted content analysis of the LAWS-critical or LAWS-advocating literature points to the problems LAWS solve and the problems LAWS cause, and hence allow for implications on how they would incentivize actors to use them or avoid using them. Together with the primary sources on different actors' positions on the human-in-the-loop question, these form the foundation for the analysis to study the incentives for LAWS's usage.

The second part of the analysis is structured similarly, although it applies a different theory to a different data set to answer a different part of the RQ (implementation). By using ACT, the focus lies on identifying not the issues of LAWS, but the specific operational capabilities they allow for, to infer on how much organizational capital and financial intensity is needed to adopt LAWS. The material to be analyzed in this part of the qualitative content analysis is largely laid out in the section of empirical material and complemented by the reviewed literature.

However, it must be noted that the use of primary sources for this thesis is small in scope and serves a supporting role. Instead, the focus lies on secondary qualitative sources to facilitate the analysis. In the first half of the analysis, the actors' positions on the human-in-the-loop question serve as a foundation to study the circumstances which inform their motivation to use LAWS. While in the second half, primary sources are used to support and substantiate the section on financial intensity.

3.2. Data selection and collection

Most of the data outlined in the empirical material section has been selected after carefully reviewing several reports on LAWS, chiefly among them SIPRI's "Mapping the Development

of Autonomy in Weapon System" (Boulanin, Verbruggen 2017). The quantitative data on military spending has been retrieved from SIPRI's general military expenditure database and supplemented with specific LAWS-related national R&D projects and example LAWS systems (SIPRI Military Expenditure Database 2017). Further, numerous examples of specific cases of LAWS' tests and deployment have been compiled from a wide range of academic articles, and, to a lesser extent, from journalistic reports (Scharre 2018).

Statements on the human-in-the-loop question have similarly been collected by searching for country's representatives' statements, primarily through publications of NGOs working on the issue of LAWS, such as the Campaign to Stop Killer Robots (CSKR) and the International Committee for Robotic Arms Control. These provide a chronology on publications and reports on LAWS since their first appearance in the academic sphere.

The timeframe the reports and statements used in the content analysis cover is from the emergence of drone and LAWS technology, starting with the new millennium, up until the time of writing of this thesis, in spring 2019.

3.3. Delimitations, reliability and validity

Given the secretive nature of military projects, data on R&D is restricted and the quantitative information referenced is partly built on estimates. Autocracies do not give public access to such, and the information which is available may be rudimentary and not represent the full picture. In the case of the US, the information published most likely serves a sort of deterrent to signal or prove technological superiority. Arguably, in the framework provided by ACT the specific accuracy of the data does not play the central role, rather general trends and relative higher or lower spending are the key information points needed.

Although, there is the possibility that organizations like this are not entirely independent, SIPRI, for instance is funded partially by the German foreign ministry, and since Germany is repeatedly a subject of their study, this may represent a conflict of interest. After a thorough investigation, there is however no comprehensible enough alternative to completely avoiding using such sources.

Due to thesis' topic being an ongoing and partially speculative affair, reliability of data may be considered the key weakness. However, given the sensitive and partly classified material analysed in the process of this thesis, new information, new regulation or happenstance leading to either, may drastically alter the conclusions other researchers might reach when studying the same subject. The coding of the content analysis is kept simple, to against (on the loop), in favour (off the loop) and within limits (on the loop) positions vis-a-vis LAWS. The arguments

and deductions made from the analysis' results are not entirely safe from subjectivity, but when information has been found to counteract this thesis' argument's narrative, it is clearly stated as such to ensure objectivity and combat the author's selection bias as much as possible.

The validity of this thesis is strengthened whenever possible by consistently arguing for the chosen data and the coherence of the conclusions and deductions. Furthermore, qualitative content analysis is the right choice of method for RQ's concerning 'why' and 'how', which is the case for this thesis (Pashakhanlou 2017: 449). Since the study of LAWS, in this case, focuses on descriptive data to analyse incentives and operational capabilities, it further underlines the advantage of choosing content analysis over discourse analysis, the latter being rather suited for understanding the context, framing, and communication.

From the theoretical perspective, the weakness of democratic peace theory is that it does not touch upon the dynamic with non-state actors, which thus far have been the primary targets for drones. This is neglectable until the moment where non-state actors will have the means to build and engage LAWS themselves. Similarly, ACT's organizational capital and financial capacity is not perfectly clear in terms of how to measure them, even though it does provide guidelines to do so. Henceforth, the interpretation of the level of these two variables may be considered a weak point and contested by other researchers, since this thesis' evaluation of these two is the point where it can least avoid subjectivity.

4. Analysis Part 1 – incentives for usage

The first part of the analysis forthcoming will present and discuss the findings on what motivates LAWS usage by operationalizing antinomic democratic peace theory and the human-in-the-loop question.

4.1. Humans in the loop of meaningful control

The human position in the decision-making loop for the use of lethal force is at the centre of LAWS, and the source of almost all the ethical concerns prompted by it. Hence, to understand the consequences of LAWS' use, one must first analyse the concept of the loop and the "meaningful human control" of it (HRW 2016; ICRC 2018).

This thesis previously mentioned weapons systems with "autonomous target recognition" which may sound like a watered-down version of LAWS's characteristic ability of exerting lethal force autonomously (Boulanin, Verbruggen 2017: 6). However, that is arguably not the

case, as meaningful human control instead refers to critical systems, hence to the selection for and engagement of the weapon.

Another common angle of critiquing the ethical concerns is the relationship between *automated* and *autonomous* and their definition and use for categorization. Automation can be defined as an object following a predetermined set of rules to achieve an equally predetermined outcome. If said set of rules and the environment it operates under are known, then so is the outcome. But the definitions and the line between automation and autonomy are not clear and can be easily contested. When the environment becomes unknown, which is essentially guaranteed in a conflict setting, then the object must be defined as being autonomous, meaning that it can make decision on how to act when faced with an unknown variable independently. On the other hand, an automated object under the same circumstances would simply fail, for the lack of instructions given for an unspecified circumstance to deal with, which would lead to either no action or one that is ineffective or erroneous.

The apparent solution for this problem would be to have a human supervising the operation. In a self-driving car, that would be represented in the human driver being able to take control when necessary and thereby to supersede the agency of the machine. This would be defined as a human being *on* the loop. However, this does not require a human otherwise for functionality. If one indeed does intervene and the machine needs an operator to steer its critical systems, then it is a human *in* the loop situation. This has been the status quo up until the introduction of autonomy in any human invention and fits virtually any machinery or weapon system existing prior to computer systems.

The rise in profile for LAWS, and the apparent ethical issues connected to the loop problem posed by removing human from some of the LAWS in use, especially in the Israeli “Harpy” or the South Korean sentry towers showcased in the previous section, have made it explicitly clear that their LAWS have the human *on* the loop classification. Furthermore, with the increasing attention given to AI technology and LAWS, more advanced LAWS of the near future will most likely go out of their way to emphasize and showcase that a human is always on the loop, to prevent any legal or public outcry. This will prove to be a slippery slope; as in an actual fighting scenario, no one will be able to verify whether someone was either remotely controlling or overseeing a LAWS. It can and will be used in a fully autonomous mode by virtue of convenience, especially when it is an all-or-nothing scenario.

Hence, flexibility as a distinctive feature of a LAWS between on the loop (semi-autonomous) and off the loop (fully autonomous) and can have only a limited reason. I argue there are two, one is that the technology simply is not reliable enough to be effectively operated

fully autonomously, which is not to say they are not capable of autonomy, just that it does not yet satisfy the effectiveness or accuracy wished for by the user. The other is to prevent or deflect criticism or legal scrutiny. Neither of these, however, is enough to defuse the concerns represented in the yielding of human control of lethal action. The former may lead to erroneous use, i.e. humanitarian law violation, due to pre-emptive usage prior to the technology's sufficient enough maturity, and the latter allows for concealing of such usage, if wished, and neither is a positive outcome.

Subsequently, some government institutions have mirrored these definitional questions without addressing the blurred lines just presented. The European Parliament's resolution on LAWS clearly defines LAWS as weapons "without meaningful human control over the critical functions of selecting and attacking individual targets" and "automated, remotely operated […] systems should not be considered" as LAWS (EP 2018: B/D). This leaves the door open to weapon systems with "sliding autonomy", which do not exclusively classify as fully- (off-the-loop) or semi-autonomous (on-the-loop) and can based on the discretion of the user operated in each modus (Boulanin, Verbruggen 2017: 6). The prime example here is the previously mentioned "Harpy" which is one of the few known offensively used LAWS which explicitly has the mentioned flexibility as a feature (Scharre 2018: 5).

Other statements fail to mention the meaningful human control, Putin, for example, simply declared "artificial intelligence is the future, not only for Russia, but for all humankind […] whoever becomes the leader in this sphere will become the ruler of the world" (RT 2017).

The Chinese government and Xi Jinping do not make any clear statements on the question of the loop, however, seem very much in favor of developing LAWS themselves and according to government plans outlined previously, they heavily invest in it. Yet, here again, there is no clear reference to meaningful human control, although China states it is in favor of regulating LAWS internationally, just with the added demand that only the deployment in conflict would be forbidden, and explicitly not their development, which several factors hint they are conducting presently (CSKR 2018). Both Russia's and China's views appears to be advocating for the removal of human control as a positive progress and hence the question left is what good would it be to have autonomous technology weapon technology for these actors if their actual use is banned by their own proposition.

The list of countries who oppose a ban on LAWS includes virtually all states who have previously identified to either possess and/or develop LAWS at the time of writing, these are the USA, Germany, France, the UK, Russia, Israel, and South Korea, among others (CSKR 2018).

So, where do the relevant countries position themselves on the loop question? A precise answer is not possible since different countries vary on their understanding of what counts and what does not for both automation or autonomy, and then what counts as meaningful human control in relation to that. But some conclusions can be made, like the countries spending the most on R&D are all against banning the technology. Instead, their argument goes that humans should stay on the loop, thereby favoring the technology *under* that supervision, but nevertheless they support the advancement.

The following table is the result of compiling the available data and deducted positions on LAWS within the human-on-the-loop context, R&D and military spending.

Table 1:

Country	Position on the loop question (in/on/off)	Known military AI R&D spending	Known civilian AI R&D spending	SIPRI military expenditure 2018 (rank/$ billion)
United States of America	On	$22,394 billion	$1,1 billion	1#/649
Israel	On	unknown	unknown	17#/15,9
Russia	Off	Unknown portion[1]	unknown	6#/61,4
China	unclear[2]	unknown	unknown	2#/250[3]
EU	On	€13 billion	€665 million	n/a
France	On	unknown	€550 million	5#/63,8
Italy	On	unknown	Unknown portion[4]	11#/27,8
Germany	On	unknown	unknown	8#/49,5

Timeframe: open ended for both 'known spending' columns on AI's R&D

Source: (SIPRI 2019)

While it's tempting to look for a correlation between stands on the loop question and the governing type of the actor, based on table 1, there appears to be too little correlating links towards democracies and autocracies each. China and Russia are arguably the two clear

[1] Unknown portion out of $346 billion for 2016-2025

[2] Ambiguous, supports ban on deployment but not on R&D

[3] SIPRI estimate

[4] Unknown portion out of €30 billion for 2017-2020

autocracies amongst them while the European countries, the USA and Israel are on the democratic side of the spectrum (EIU 2017). China's lack of data and ambivalence on the loop question makes it a difficult country to analyze and Russia then stands alone in its category.

4.2. LAWS, ideal weapons for democracies?

After reviewing positions on LAWS and military expenditure data in table 1, has revealed no correlation between governing type and LAWS's incentive, this section will first look on drones before continuing to analysis LAWS's incentives.

Based on the available data on drones, and the history for both their development and deployment, most countries that have pioneered drones, and now by extension LAWS, are democracies (IISS 2011: 20-26). Two thirds of the countries listed are on the democratic side of the spectrum and, these same countries that have been spearheading drones and unmanned vehicles in the last two decades are also today's leading producers, users, and researchers in the field of LAWS, namely the USA and Israel (Sauer, Schörnig 2012: 364). This is consistent with the trajectory of development of LAWS from drones, which is building on and continuing the technological advancement. Henceforth, there appears to be specific incentives for democracies for them to have acted in the way they did. What limitations and incentives does the status of being a democracy grant them that might explain the initiation and ongoing developments in relation to unmanned vehicles, automation, autonomy and LAWS? This section will draw on the previously outlined theoretical framework for antinomic democratic peace theory and the findings of the previous section (table 1).

The specific institution relevant to the analysis is the mechanism of how a constituent's will and opinions are getting translated into political action, in this case the support or opposition to an armed conflict (Kaag, Kreps 2013: 107; Sauer, Schörnig 2012:365). In autocracies, this is simply a question that does not pose itself, the ruling authority decides independently. Democratic institutions, in contrast, impose limits on the decision the government can take, because they must consider the effect on their constituents whom they can be held accountable by. As this thesis has outlined in the literature review's theory section, the decision to engage or continue to engage in an already running conflict must be justified constantly and convincingly. In the case of the political climate at the time of writing this thesis, where there is economic uncertainty, rising inequality, and populism gaining traction on both sides of the political spectrum, this is not an easy task. For instance, when one country's soldiers are being killed overseas, the democratic government must justify their presence in the conflict zone. Conflicts as far back as Vietnam in the last century, or the various ones in the Middle East, have

previously been seen to have exerted such pressures on the government that decided to join them. Another lever against such a government can be the cost of overseas missions, requiring explanation to the public for why its funds should be allocated abroad and to what benefit, especially if the results are not what was promised. The Iraq war is the prime example here, where stated goals were not met and eventually the pressure to withdraw succeeded.

Henceforth, there are two distinct levers democratic governments face, one is that of armed personnel's death abroad, and the other is that of money spent on abroad military action, both can be addressed and possibly negated with the LAWS as the next sections demonstrate.

4.2.1. Risk aversion

One of the main advantages of unmanned vehicles when they were introduced is the removal of fatal risk to the pilot, which is their defining characteristic. LAWS as drones' successors share this and subsequently move it one step further (Boyle 2015: 122). While drones represented the relocation of an operator out of the immediate danger in a zone of conflict and into a location in the operator's home country, from which the drone can be safely and remotely controlled. LAWS under a human on the loop are reducing the system-to-operator-ratio from previously one-to-one, to one operator to multiple LAWS, with the potential to have the number of LAWS under supervision of one operator drastically increase in the near future.

Therefore, one can conclude that the risk borne by any actor involved in active fighting missions is reducing parallel to the advancement of remote-control technology and autonomy (Scharre 2018: 13). Previously, before drones and LAWS, the ratio was at least one operator to one weapon system, no matter if this was a gun, a tank, a helicopter or a plane, or some of the larger examples such as ships requiring much more than one operator. The introduction of unmanned systems then physically removed the operator from the weapon system, thereby eliminating the risk of death for the operator.

One can make the argument that LAWS, at least for the factor of risk reduction, do not make a difference from unmanned drones. But the change in ratio does affect the second lever of costs significantly as the next section will elaborate on.

4.2.2. Cost reduction

Apart from reducing or even eliminating the risk for a system operator's life, the change in the ratio previously described also leads to the second factor, cost reduction. The financial means necessary to deploy military means, their personnel, and their training for such operations cost massive amount of money (Shaw 2017: 458). LAWS, once developed, provide the potential to

reduce such costs significantly. Even though their development may at first require substantial financial investment, once developed and deployed, it is a weapon system easily mass produced. Unmanned drones like the US's Predator or Raptor models cost a fraction of a manned, state of the art fighter jet such as the F-35, and the US "Sea Hunter" has a price of about $2 million per unit, a price tag so low that it costs around the same as a singular cruise missile used by many contemporary militaries conventionally (Scharre 2018: 78/93). One can easily imagine a production with 3D printing technology for small-scale LAWS used within swarming formations, which are already being tested for and have profoundly good cost/benefit ratios (Lachow 2017: 97)

Another facet not yet considered are the funds saved for the training of the pilot, as a manned fighting jet needs continuous training in real flight conditions to sustain the already through previous training acquire skillset. This is equally true for a drone pilot, however here the operating costs, as well as the weapon system costs are much lower. Then, the progressive step to LAWS makes this continuous training aspect even irrelevant, as the skill of operating is outsourced to the operating system itself, and machine learning and continuous training (more data to learn from) will make LAWS more capable over time. Henceforth, the more proficient a LAWS becomes via 'training' (machine learning) with narrow AI applications comparable to contemporary commercial used algorithms of several large tech companies (social media), the more potential for cost reduction builds up (Ayoub, Payne 2016). This may lead to a run-away effect, the more usage, the cheaper it gets, because one can build on the accumulated training and copy it and expand on it endlessly, this could be an exponential curve in every sense.

Independently, for the argument of incentivised use of LAWS by democracies. Countries across the democracies/autocracies spectrum such as Russia, who are lacking the manpower they want, or Japan whose population is ageing rapidly, or Germany whose military is not sufficiently attractive to sustain its personnel, this is more than an option to save money but also an option to sustain existing capabilities in the light of a shrinking or insufficient workforce (Boulanin, Verbruggen 2017: 63). This may be the leading factor in why Israel is in such a leading position when it comes to LAWS technology, their geographic location and numerical disadvantage with surrounding states generally hostile towards them, they fully employ the lack of workforce argument.

4.2.3. Interoperationality

Interoperationality can be analysed and used on two different dimensions. One of them is within a singular military organization's different branches (Navy, Airforce, Army), and the other is

between different militaries as a whole and within their respective branches, making this a multidimensional network capability. Therefore, the more complex a given military organization or multinational military alliance, the more useful are the advantages for networking technology to be utilized.

This does not exclusively make it attractive to democracies only, who in the case of NATO are comprised of a high number of relatively small armed forces and a few larger ones. Instead, it is an advantage for any military, no matter if it obeys to a democratic or autocratic system. However, the attractiveness for democracies may still be greater since they are seemingly more likely to use both dimensions simultaneously and thus multiply the effect. Versus one who only uses it within one dimension of their own military's branches.

Applications for such interoperational capabilities can take several forms, different vehicle classifications can autonomously create, coordinate, and sustain formation in movement, in the air, sea and land or any combination of such, and similarly can collectively react to external inputs (i.e. hostile appearances etc.). Reactions to such could also be done in such a way, defending against incoming projectiles or reconnaissance can all be done over a multitude of levels and branches within a military operation to the benefit of all units involved. Systems specialised in one area could request assistance, relay information etc. within seconds, something a human would need minutes to compute, comprehend and follow up on. The overall capability for different systems, and they do not explicitly and exclusively have to be LAWS, they could be sensors or even satellite information, is that they can all autonomously collaborate with other systems and strengthen their overall effectiveness.

4.2.4. The accountability gap

Connected to the human's position in the loop of decision-making on lethal force, is the accountability for any such decision made. International Law, International Humanitarian Law, human rights, and the Geneva convention all together provide a comprehensive legal framework to hold actors accountable for various war crimes, genocides or use of certain restricted weapon systems (biological, chemical etc.) when such acts are committed. While the discussion on the effectiveness of these institutions (such as the International Criminal Court) or treaties would go beyond this thesis' scope, the absence of the human in the loop would nevertheless severely weaken this existing system.

With the absence of human-in-loop, which exists in at least some of the LAWS being used today, the question of who to hold accountable for any deeds in breach of international law arises. As previously discussed in the literature review and its theory section, the accountability

gap is a highly contested issue amongst the scholars researching LAWS, and I agree with the opinion of most that LAWS essentially eliminate any realistically enacted accountability (Sparrow 2017). In theory, one can make a relatively simple argument that whoever sent a LAWS to do anything is responsible for whatever occurs. However, with the increasing proliferation of armed drones and the thereon following proliferation of LAWS makes this increasingly difficult, one can even argue that these are not distinguishable by optics, considering most LAWS in existence are airborne and share the unmanned characteristic with drones (Horowitz 2018: 49). Already, drones strike with civilian collateral deaths escape most accountability, and with the increase of their share in the world's airborne weapon systems, identifying who is responsible for which airstrike will increasingly become more difficult.

When accountability cannot be prescribed to a LAWS itself, since a machine cannot be prosecuted or held accountable in any way, and simultaneously a machine can be built without any clear identification to whom it belongs to or even is equipped with a self-destruct mechanism, then a military strike can be conducted without any trace of who is accountable for it (Sparrow 2007). In a contested war zone such as Syria, this is a scenario not too farfetched. Likewise, then, if a machine is truly acting autonomously, neither the manufacturer nor software programmer can be held accountable.

The blurring of accountability is a double-edged sword which does not grant clear incentives to either democracies or autocracies, however both sides can have an equal use for them. Espionage, assassinations or decapitation strikes against an enemy are actions perpetrated by all sides. For democracies, in this case, being able to avoid accountability can be much more significant than for an autocracy. Even though both would benefit from that capability, democracies would face not just external consequences but also internal, via protest and political pressure, while autocracies would be mostly immune against such consequences.

4.3. Findings on incentives for using LAWS

The application of the theoretical framework of antinomic democratic peace theory on the material of LAWS to determine how they incentivize their use for democracies and autocracies has led to mixed results of the incentives, as the previous sections explain in detail. Likewise, Table 1 has shown that there is also no identifiable correlation between democracies and autocracies in their position on the loop-question and their funding. Although is most likely because of the lack of available data.

Neither has been found to exclusively have an incentive for the use of LAWS, the other does not, but rather, the incentive exert their effect to different extents on both simultaneously.

The risk reduction for military personnel is by itself an advantage for any military, no matter the corresponding governance type. However, the more restrictions, accountability, and due process there is involved on the use of force, the more of an advantage the removal of the risks for fatalities is for an actor. The ability to wage a war without risks for a country's soldiers hence incentivises a democracy much more than an autocracy, who can at will conscribe, train and engage soldiers.

The argument adopts the same structure when applied to cost reduction, the same particularities, public accountability to official budgets most of all, make a cheaper, less risky for one's own soldiers' armed conflict more attractive for a democracy than for autocracies. Who, again, can simply allocate all the funding necessary, given they have it, without having to argue for permission or fear accountability for its actions.

The strength of the incentives considerably lowers with the last two categories as compares to the first two. Interoperationality appears to be a more prevalent concern to large alliances made of smaller member states, such as NATO. However, if similar structures exist in an alliance of autocracies in a conflict, the same benefits would apply there as well. Based on the current structure of military alliances, (EU, NATO) democracies are arguably are set to benefit more substantially than autocracies.

Moving on, accountability is a double-edged sword, and with its blurred nature, has been utilized by both autocracies and democracies, exemplified by the extended drone strikes in the Middle East by the US, or the absence of any insignia of alleged Russian soldiers in the annexation of Crimea, suggest that either of the types in question has it in their interest to conceal responsibility, and with it accountability of certain military actions. Yet again, the consequences of being revealed in doing something clandestine in a military scenario are expectedly more costly for democracies through established mechanisms of accountability than for autocracies.

To conclude this section of the analysis, LAWS appear to exercise the same incentives towards both democracies and autocracies. However, in relative terms, the incentives have more weight for the former than the latter and hence explain their prevalence in LAWS use, funding and R&D.

5. Analysis Part 2 – implementing a general enabler

The first half of this thesis' analysis has studied the incentives LAWS provide to their user and have found a wide array of beneficial effects, which attracts not just one type of government

but all, in varying levels. The second half of the analysis examines how these actors can adopt these new systems into their existing military organizations with the previously outlined ACT as a framework, and how LAWS will diffuse between them and affect the broader system.

Here, it is important to note the difference between *adaption* and *adoption* as they can be easily mixed up and this slight difference comes to a large effect. Adoption, as in ACT, refers to incorporating an external change into an internal one. To illustrate this in a military context, this means a technology, for example stealth capabilities in jets, being transferred from an experimental laboratory into an actively used unit. This is placed in juxtaposition to adaption, which refers to the modification of a process to accommodate something new. To stick with the preset example of stealth jets, adaption then is to use them in a way considerate of their new stealth capabilities and taking advantage of it. Adaption in this context would be a counter strategy against an enemy who has a capability you yourself do not.

LAWS however, are not a singular technology or singular system to be adopted as standalones, as in previously used examples such as a fighter jet, but rather, a more fitting description of what using AI on weapon technology would result in is to see it as a "general enabler" (Horowitz 2018: 39). This does not mean that a standalone example, such as those given in the material section are invalid, but rather that the defining characteristics of weapons systems such as the US's Sea Hunter, the Israeli Harpy drone, or the Korean sentry weapons are not their specific classification, but their ability of autonomous action. When considering how actors are adopting those, one must keep in mind that the objective of these is the capability of autonomy not the adoption of weapon system *x*.

This makes it necessary to first assess how autonomy precisely changes a weapon system and its attached operational benefits, to then subsequently give an answer to how this technology can be adopted by the applying the two key factors of organizational capital and financial intensity.

The first of such benefits seems rather vague at first but has profound effects when applied. This benefit is *operational speed*, the time it takes a machine, or its algorithm or computer, depending on the level of advancement of the LAWS, to "observe, orient, decide [and] act" (or OODA). No human soldier or operator can hope to match their speed in a direct comparison. But even if a LAWS leave the "act" part out of OODA and thereby leave that final decision to a human (i.e. human-on-the-loop) their ability to "collect, collate and analysis" data in terms of complexity and volume still immensely improves the quality of the decision cycle as a whole (Ayoub, Payne 2016: 807; Boulanin, Verbruggen 2017: 61). As such, it is no coincidence that most of the currently deployed LAWS with autonomous targeting recognition are used in

situations that require faster than human reaction time, mostly in defensive circumstances against incoming projectiles (Scharre 2018: 43).

The speed aspect can be extended to that of *agility*. Planes, for example, would no longer need to harbor life support system or fly below a certain G-force threshold to keep a human pilot alive (Altman, Sauer 2017: 123). Onboard sensors and autonomy further relieve the reliance of direct piloting and oversight.

Another connected factor is that of *persistence*, LAWS without the need to keep their human operator alive are also relieved of the basic human limitations of sleep, fatigue, boredom, hunger, emotions of fear or hate, to name just a few. A LAWS, once given an order, will follow up on its completion without those limitations playing any role in it, which links to the questionable ethics surrounding LAWS.

With the same sensory abilities, advancing the *accuracy* of any applied weapon system is also increasing in parallel. This is allowing for either targeted strikes against under-humanitarian-law-legitimate targets, thus reducing civilian collateral damage, but simultaneously on the other hand, it also allows for targeting people in a discriminatory manner (Kaag, Kreps 2013: 105). Overall, this may lead to the decreasing of the destructive potential of weapons and instead reorient it to what is contemporarily known as surgical strikes.

With all these capabilities, drones and LAWS seem not too far removed from one another, however one of their distinct differences is their *reach*. Drones need a continuous link with the operator who remote controls it, which limits the area they can operate in, and these signals can also be intercepted or scrambled or both, to either compromise or reveal an operation involving drones (Sauer 2016: 9). LAWS, however, due to their autonomy can operate without these limitations entirely, described as the foundation for the risk aversion in a previous section.

Lastly, the potential for *coordination* between units, such as in swarm behavior in a narrow sense, and in a broader sense in sharing information and collaborating between military branches (in a sense the same as interoperationality), has to be considered (Lachow 2017: 100). In effect, human-on-human collaboration is inferior to machine-on-machine collaboration for the above outlaid attributes and capabilities, paramount amongst them being the speed and the OODA cycle.

But are these factors and examples of LAWS thus far given sufficient for ACT's required demonstration point (Horowitz 2010:24)? The criteria are clearly outlined in the source, first of which being that the "potential of its full capabilities" must be widely known. On the basis of this thesis' puzzle, publications, UN expert meetings (ICRC) and multi-billion investments from governments, defense contractors and commercial companies around the globe, and the

fact that the public profile of the issue of LAWS has been steadily rising since the beginning of the decade, I believe that this is indeed the case, and thus this criteria is met by LAWS. Even though the USA is the only country which has officially stated a strategy and investments plans for LAWS, other major militaries seem to be following suit.

The second part is less clear, the innovation must go beyond the mere debating, and even though there are examples for deployed LAWS, they have not yet had the breakthrough internationally which appears to be needed to meet the criteria. Drones and unmanned vehicles, however, most certainly have reached it and proliferation excels (Schulzke 2018: 15; Farooq 2019). If one considers the line between drones and LAWS as weak and ambiguous and accept that all that is needed to transform a drone into a LAWS is a software update, then the case becomes more tangible. As is demonstrated foremost by Israeli UAVs such as the "Harpy" which depending on the modus it operates in can be consider a LAWS or a drone and is being exported.

Various actors are adopting LAWS on top of unmanned drones into their militaries, and the next sections will further examine the question of how autonomy, rather than LAWS as singular weapon system, is implemented.

5.1. Organizational capital

Most broadly speaking, organizational capital is not tangible or measurable, but with the criteria given by the source, some broader observations can be made when applied to the case of LAWS and autonomy. ACT argues that the more bureaucratically disruptive the technology is to implement, the more difficult it will be to do so. The age and complexity of the implementing organization is the most important indicator. Large, well-funded militaries such as those of democracies like the US's and some European countries' are thus bound to have a very high organizational capital and then face disadvantages in implementation of new technology such as LAWS:

However, if one sticks to the core of the technology to be adopted to be software and not hardware, then the picture suddenly changes. Once the hardware (UAV) exists and it is remotely controlled, and all it takes to make it a LAWS is a software upgrade (autonomy), and from the outside the difference would not be visible (Horowitz 2018: 49). The existing organizational structure does not have to compete with the innovation directly but can rather supplements and supports the existing structure, via narrow AI applications. Especially, if countries stick to the human on the loop model so far emphasised.

There are exceptions to this non-competition line of argument though, one appears once subsections of an organization who use autonomy compete over funding with those who do not. But given the broad applicability and improvement potential for any given military this does not seem an obstacle. Once a software has mastered a certain skill, it can be copied and sent around the world in an instance, while a human training would take time, funds and personnel. Thus narrow AI's machine learning would first gradually, then exponentially overtake human skill (Ayoub, Payne 2016: 794; Horowitz 2018: 45; Boulanin, Verbruggen 2017: 81).

Another, potentially much more fatal exception occurs once the above described development threatens to make human personnel obsolete. When adoption begins to mean replacement, parallel to how robotic automation has started to replaced factory workers, one can be sure all "veto points" of an organization threated will be utilized to stop such developments whenever possible (Horowitz 2010: 38). In the very long term, such efforts may be overcome, but in the short term the disruptions posed by resisting beneficiary of the status quo are certain to be significant.

There is already precedent for this where there is information available. The US's X-47B drone, capable of aerial refuelling and aircraft carrier landings has been defunded and instead the fund were used to supported a manned air-to-air refuelling platform (Cummings 2017: 9; Horowitz 2018: 48/56) When considering that those are capabilities which do not involve one of the major advantages of LAWS, that of removing the risk of death, it becomes more apparent why it has been vetoed.

Another obstacle in adoption on this variable is that of training, to take advantage and use the capabilities, militaries need personnel trained and knowledgeable on computer science and have the skill necessary for operating them. Tension between those new recruits of a sort on of the kind of the old is likely because of skillset and thereto connected allegiances not closely aligned, with the more hands-on approach of pilots, drivers and marines, traditionally found in militaries (Cummings 2017: 9).

To conclude, based on the discussion above, organizational capital needed to adopt autonomy enabling software for LAWS is certain to be high as demonstrated by example above. LAWS and their enabling software harbour a substantial disruptive potential for contemporary, long standing military organisation.

5.2. Financial intensity

Financial capital is the amount needed to properly implement an innovation and in praxis, and there are some practical difficulties in the range of that capital. Small scale drones are easily

commercially available and are comparatively easy to weaponize, while LAWS in the form of larger, more sophisticated air or seaborne vehicles are substantially more expensive and require a broad range of technological know-how (Horowitz, Kreps, Fuhrman 2016: 34/35). Small scale ones, however, are accessible to resources-poor non-state actors or even individuals is possible and has precedent (Scharre 2018: 102).

While the other requires a government standing behind it to be feasible. Yet again, when downsizing the subject in question from the LAWS to the software allowing for autonomy, the financial intensity comes more tangible. This differentiation thus splits the financial capital considerations into a civilian and a military sphere.

5.2.1. The civilian and military spheres

The software allowing for autonomy has foremost commercial origins, especially in terms of tech companies who rely on algorithms. Narrow AI are on the forefront of this technological development (Ayoub, Payne 2016). As such, there is a clear overlap between the applicability of this technology for civilian use and the ease with which it can be used militarily thereafter. ACT suggests that if there is civilian use and thereby commercial incentive to create a technology, the level of financial intensity necessary is low, as opposed to high if there is an exclusively military usability.

The financial data that is available, restricted to the democracies of the European Union and US, suggest there is a substantial amount of money being invested into civilian AI technology under large scale economic investment programmes. Italy and France and the EU itself are investing hundreds of millions of Euros in the coming decade and the US has pledged billions of US dollars, as laid out in the empirical section previously. While the US has published information on specific investment into military investments, the EU has done no such thing, however it has admitted that “even if the programme has a strong economic focus, substantial parts of the research funded is of relevance for defence and can lead to technologies that will be used by defence actors.” (EU 2014: 43).

Henceforth, the financial intensity for autonomy allowing software is low, due to the high commercial incentive to develop them and the subsequent ease with which national governments could in theory acquire them and apply to their weapon system. Adopting them into existing military hardware is relatively cheap if the developing costs do not have to be carried solely by the state. Although with the recent rise in profile of AI and their weaponizations, commercial AI companies, such as Google’s DeepMind have publicly stated they would refrain from cooperation or collaboration with the (US) government on military

application of their AI software (Future of Life institute 2015). Leaving it to be seen if such collaboration will occur in the future and if so, visible to the public.

5.3. Findings on LAWS's implementation

Based on the theoretical framework of adoption capacity theory, this second half of the analysis has examined and evaluated the organizational capital and financial intensity variables based on the available data and academic literature to allow for a final conclusion on the nature of implementing LAWS into a military organisation, corresponding with the second part of this thesis RQ (implementation).

Organizational capital has been found to be high, based on precedent, as LAWS are found to be highly disruptive to an organisation's status quo. This is due to a variety of factors described in the corresponding section.

Standing in contrast, financial intensity has been found to be low. This is chiefly because of the high commercial, and hence civilian, involvement in the R&D of narrow and AI. High applicability to civilian usage such as self-driving cars, and tech companies' algorithms have made it a business of enormous proportions, and thereby is trailblazing a significant amount of the R&D costs. In theory, this technology can easily be converted into applications for military use, although there is not yet enough evidence of that happening on any measurable scale. It is, however, believed to be taking place in countries like China, which embraces the dual-use aspect of AI for civilian and military applications like no other nation known publicly, while in the USA at least, there has been resistance by commercial companies to allow military access (Boulanin, Verbruggen 2017: 103).

With these two findings on a high organizational capital and a low financial intensity as the key variables to operationalize ACT, the following conclusions can be drawn, based on Horowitz's ACT framework.

The first finding is the diffusion rate of LAWS technology is predicted to be of medium speed, thereby making a continued proliferation the most likely scenario (Horowitz 2010: 40/Table2.2). Building on the already widespread use of drones, UAVs and other unmanned weapons, the entry barriers for any new adopter of LAWS is considerably lower than one might imagine. Commercial interest is heavily invested in narrow AI and autonomous technology, thereby keeping the financial intensity (R&D) costs low, especially if one can adopt it for military means on existing technology. This will most likely occur in the form of upgrades of the existing systems with autonomous capabilities rather than the development of a new 'from scratch' weapon system.

Furthermore, with high organization capital, LAWS require processes and applications in completely new ways. In the military context, since these types of innovations will require conduct to differ, rather than doing it 'better' than an adversary, research and development segments of leading military organizations are more likely to dismiss early signs of the innovation as irrelevant to core competencies, as evident in the X-47B example. Placing an advantage towards newly rising powers, such as China who can mend their structures accordingly while building them up, rather than adapting them retroactively (Horowitz 2010: 49/Table 2.3).

6. Implications and further research opportunities

Due to the high organizational capital required, one can assume that any first mover advantage gained will be significant, due to high levels of AI and computer science related expertise whose produced knowledge will be exclusive at first. This seemingly points to a competition between China and the USA, mirroring an economic competition in the same sphere. Israel and South Korea also fit this picture, as all leading actors in LAWS technology have a significant tech economy. But this does not match with the available data and information on LAWS, therefore I would disagree with some scholars who already have called the start of an AI arms race, and rather describe it as an economic competition with the potential to escalate into an arms race (Geist 2016; Roff 2019). This would invite further academic scrutiny, especially as it has the potential to trigger a classic security dilemma.

7. Conclusion

RQ: *What would motivate actors to deploy LAWS in conflict, and how would their use change the conduct of the military using them, and the characteristics of the conflict that they would be involved in?*

Based on the findings after operationalizing democratic peace theory and adoption capacity theory to scrutinize LAWS incentives and their implementation respectively, the following results were reached.

LAWS incentivize their usage over two key levers, aversion of risk for military personnel and cost reduction. Two lesser levers of inter-operationality and an accountability gap have also been identified. Democracies and autocracies are both affected by these, but not to the same extent. Democracies are more likely to benefit from interoperationality due to a higher

prevalence of multi-dimensional usage opportunities. Through democracies' institutions of political accountability via their respective electorates, the decision to use violence is restrained and limited. LAWS have been shown to undermine and negate those.

Implementing LAWS has been demonstrated to require high organizational capital and low financial intensity. The former, through a disruption of processes via their automation, the need for newly trained personnel and the danger of eventual replacement of existing capacities, and the latter through vast commercial activity in the field of AI which allows for a cheaper transfer of the technology from the civilian to a military usage. The nature of autonomy, being quintessentially a software, which can be used on interchangeable hardware, makes a spillover more likely to occur.

All these factors make LAWS certain to proliferate further at a medium speed and predict a severe change of conduct towards autonomation and autonomy, risk aversion, and depersonalization of organized violence. LAWS would have the potential to upset the current balance of power in favor of newly rising powers, which are reasonably more likely to conduct a better adoption process than the rest.

Lastly, a key facet of this study has been the concept of meaningful human control and what it means if it is given up upon. This study has found that no major actor in LAWS's R&D is willing to curb their advances due to the ethical concerns it raises. The movement to ban LAWS internationally has not made any significant progress beyond raising the profile of LAWS thus far (CSKR, ICRAC). Rather, the advocacy of the 'human-on-the-loop' model seems to be convincing enough, making the appearances of LAWS with sliding autonomy settings likely to grow in the near future.

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