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USE OF FORECASTING SYSTEMS IN THE MILITARY DECISION MAKING PROCESS

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ABSTRACT

Watching carefully and exploiting the colossal potential of global cutting-edge technology should be a priority for any army that looks to sustain the welfare and security of all its soldiers. The expanded spread of information and opportunity far and wide the globe has been aided indisputably by an exponential boost in high-tech novelty, especially from powerful military organizations such as NATO. The purpose of a designed forecasting system destined for all kind of disruptive technologies is reducing surprise which is associated to disruptive systems and also to train the commanders to take efficient decisions concerning the possible threats in the future. An effective forecast should acumen the possible, focusing less on the probable. Furthermore, forecasts ought to be measured according to their capacity of securing disruptive effects with a high-impact, instead of correct-to-incorrect prognosis that they make. Disruptive technologies can influence the military decision making process in a positive or negative manner. The outcome of the effects is highly reliant on the perspective that a disruption that is harmful to some will benefit others.

KEYWORDS: disruptive technologies, intelligence cycle, roadmapping, military planning, forecasting systems

1. Introduction

Standardized technology which can forecast events dates way-back to the years which followed World War II when was realized the so-called Delphi method, which was an organized process for bringing out cumulative high-value opinions given by experts, considering technology development and its influence towards military environments. Also, war-gaming and scenario planning surfaced as influential forecasting technology methods which experienced an exponential growth in fame in the 1970s.

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These methods combined with other quantitatively directed methods such as trend analysis and extrapolation are still used nowadays. Each and every forecasting methods reckon somewhat on the investigation of relevant historical info. Nonetheless, a segregated dependence on historical info surely can lead towards a misjudgement on revolutionary aspects of innovation and might expose the military planner to the obscure from quick or unpredictable developments. Considering the capacity of disruptive applications and technologies to drastically reshape a military environment, forcing out occupants and influence population on a large scale, a crucial urgency toward technology forecasts appears, because it has to rapidly determine disruptive technologies focusing on the understanding of their true potential and its disruptive effects. Without any doubts *"forecasting outputs are truly fundamental to producing useful tools of forecasting in the outcome of a fruitful result in the military decision making process"* (Halal, 2009).

2. The Impact of Enhanced Forecasting of Disruptive Technologies in the Military Decision Making Process

Military leaders take decisions on a daily basis and their commands are decisive when it comes to the lives of the soldiers involved in operations. Those decisions are taken based on a high-level of education, military training and experience. The army has developed set procedures destined to suport the commander in developing a plan or a specific course of action, called MDMP.

The utility of technological surprise was remarked in 2006 as one of the plausible threat strategies which could challenge NATO's military capabilities. *"Forecasting disruptive technologies or events is crucial to an army for a few reasons"* (Shaffer, 2005**)**. Before all else, in military operations, relying on state of the art technologies and anticipating disruptive technologies are imperative to staying competitive. Moreover, well developed armies minimized surprise by securing its high-end technology secrets. Nowadays powerful armies and also some non-state third-parties become more and more technologically advanced as purchasers of cutting-edge technology or as constructors or even both. Thus, it follows that the military superpowers can not acquire anymore technological dominion in all the areas of technology advancement that could be utilized for military reasons. *"In the new paradigm, the military needs to stay abreast of new technologies as well as of new applications being developed throughout the world in order to avoid military surprise"* (Lele, 2018). Lastly, despite many consider that military super powers did a good job at keeping up-to-date of advanced military technologies, they could nevertheless be startled because of the abundance of all sorts of technologies spread on markets all-around the world which could generate some unpredictible disruptive military technologies and applications. Furthermore, the ubiquity and potency of improvised explosive devices attacks towards NATO's troops in Iraq and then in Afghanistan combined with the use of commercial planes against NATO's forces are true examples of how terrorists can exploit commercial technologies and how much damage can create which eventually can put military planners in very difficult situations.

2.1. The Intelligence Cycle Model as a Forecasting Tool in Military Planning

The intelligence cycle and its circle of links represents a collection of subsequent and repeated operations: establishing decision makers' requirements for information, gathering relevant data, assesing the data for authenticity, afterwards analyzing their meaningness, disseminating the resulting product to decision makers and then the process starts

from the beginning by passing the decision makers' revised requirements to the collectors. First of all the intelligence cycle begins as simple as it gets with a question, which sets up a productive hypothesis generation fueled by passive data gathering from the internet or from the media and active data collection from crowdsourcing or war-games. Then, *"the data is converted through hypothesis evaluation and testing by planners through mechanisms such as war-gaming and crowdsourcing"* (Howe, 2006). The crude results derived from the processes are transformed into different scenarios by the military planners and then are resent into the hypothesis engine.

The model design can be realised based on factors such as:

– **The judgement of "what if?"** in which the process of forecasting is started with a broad-view question adressed for a specific audience by the military planner. Bringing forth the "what if" question-based organic hypotheses depends upon a high level of knowledge of the forces that forge the context of the client, which turns out to be a commander's main factor who is responsible for all interaction with the actors involved. All through the evolution of the forecast, the commander will be given assessments from the processes of data-gathering, hypothesis-generation and evaluation in order to be able of assigning parameters ensuring that the final scenario focuses on its original objective.

– **Hypothesis generation and refinement**. The organic hypothesis based upon the actors' substantial question "what if" is sent towards an co-depended operation of both passive and active data collection, inquiry followed by the generation of hypothesis. Then, the military planners ought to include a solution to the question, afterwards send the revised hypothesis to the engine, to analyse its functions both passively and actively. The forecasting model's hypothesis might be *"Information is passively gathered using software-centric text-file and multimedia data extracting and statistical analysis in order to identify apps, technologies, or even ideas that might have garnered huddled interest, that span subject areas, or cross territorial boundaries"* (Allen, Zhenhuan & Kaveh, 2018). Such a model could be put together fairly quickly with a small amount of information and then sized-up by increasing the volume and diversity of information which is being extracted according to the needs of the military planner. Moreover, all the inputs are thoroughly cross-examined, analyzed, and carefully synthesized in order to be thrown once again into the organic hypothesis by the data planners, who research and develop new ideas from public data sources, subject-matter experts, and information gathered from intelligence community databases, eventually creating apps and technologies destined to offer a better understanding of the military environment.

– **Hypothesis evaluation and testing** is based upon a straightforward process which starts with a question and afterwards identifies signs and lastly generates the hypothesis. Basically, the hypotesis is analyzed thoroughly both by human and software systems in order to identify future possible scenarios. Nonetheless, the purpose of this phase is closely linked to the particular hypotheses, which leads to the main objective, intending to analyze instead of developing the hypotheses. During the data-gathering it is crucial to pinpoint the signs for having a clear view of the events of a possible disruption and to select parameters which might be utilized to anticipate the timing of a disruption. The evaluations might also comprise the influence of the nationality, proficiency, and socio-economic status of the hypothesized stakeholders. The outcomes of this evaluation and testing of the hypotheses along with complementary evaluations, are highlighting a two-fold purpose such as generating the final

potential scenario that contributes furthermore towards the development of the hypothesis generation and refinement function.

– **Identifying possible outcomes**. Scenario planners provide the final future scenarios to the actors involved in operations, taking into consideration the scenario analysis mentioned above. In a classification-type system the normal and deviation data will allow consensus to both unorthodox and proven scientific opinions to be taken into consideration. Scenario planners might consider a wide range of areas such as cutting-edge technology, social, political or financial buzz, even including fantasy, as they aim for the highest percentage of credibility, as well as some factors that might block or even accelerate progress, with convergence or divergence of applications making their presence felt on the long term. Thus, the scenario set-up needs to be really convincing in order to be powerful and to inspire decision-makers to take action as soon as possible before the event occurs, so that they in turn can analyze and pass on the information to all parties involved in the decision-making process, at all hierarchical levels.

2.2. Roadmapping Model as a Forecasting System

The next forecasting model approached in this paper is the roadmapping model. It aims to build a roadmap from the present-future equation in order to predict possible future scenarios based on all the data gathered, including the observations of all the actors involved in the planning process. The defining feature of this model is the creation of time indicators that will be monitored throughout the journey, resulting in multiple scenarios that provide a picture of the future.

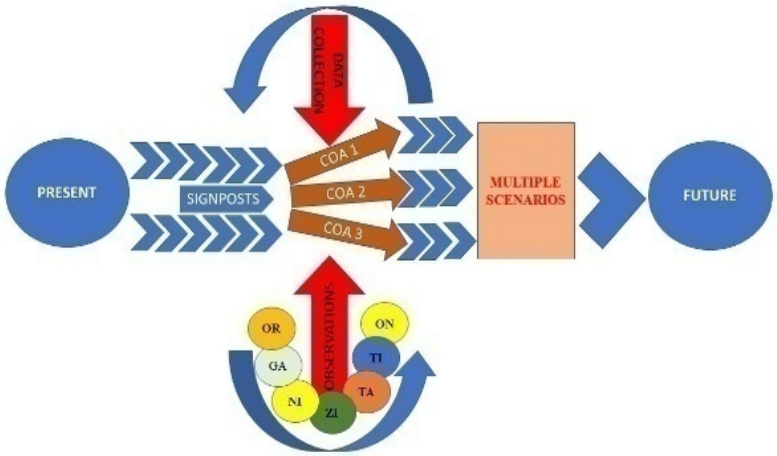


Figure no 1: *Roadmap model*
(Source: Authors)

The primary elements of the system are:

– **Idea generation**. In such models, the initiation process focuses on selecting the actors involved, observing in detail the actions they take, and finally generating the ideas that are needed to interpret future outcomes based on these specific activities. For the benefit of this forecasting system, it is imperative to have a multitude of actors so that the ideas are tangible and conceivable. In the class of the unknown-unknown, data-collecting activities could focus on technology testing to the purpose of generating theories and test their viability. *"In the class of known-knowns, seeking for the quick acceptance of well-understood technologies which are*

emerging on markets or the utilization of reverse innovation might suggest a disruption intend to take place" (Govindarajan, 2009).

–**Mapping techniques, processing, and evaluating outcomes.** In this case, the system can automatically data-mine the Internet searching for breakthrough theories and terms; then, it should also search tag clouds and even acquire information from social networks. Other capabilities include extracting information from, books, tv shows, movies or games by having a predetermined set of searching rules based on the operation requirements. This will demand human work in order to set the foundation of the creative envisioning. *"Another technique for lengthening the magnitude and reach of the fresh new ideas being collected is to observe a trend and then extend it to an unreasonable extreme or to speculate the opposite in which the trend reverses"* (O'Donnell et al, 2021) (i.e., the density of population into urban zones). Then catch this trend in the reverse direction, directly to the opposite extreme. This process is similar to the "what if" dictum that takes us to the science fiction field where refining ideas from the science fiction spectrum can ultimately help generate ideas. Basically, the main objective is to generate anomalies, borderline stuttering scenarios.

–**Decision makers feedback.** The power of roadmaps and the resulted scenarios which materialize from this process highlights the fact that the foundation of a forecast system is ultimately revealed as a report to a decision maker. In this case, the report should include all the scenarios, signals and signposts, concluding with the impact of the forecast model. Therefore, *"the scenario's impact needs to be analyzed taking into consideration most of the human issues which are happening on a daily basis in order to make it suitable, understandable, and reliable"* (O'Hanlon, 2018). To offer a truly compelling feedback, the scenario might be presented in the subject of a war-game, which would lead to a better understanding of an individual's point of view, especially when it comes to environments which are controlled by terrorist groups because it will offer a perspective of that specific area of operations and how a technology would uniquely affect that area. The main objective is to determine decision makers to take action, based on all the criteria mentioned.

2.3. Risk Management of the Forecasting System

The forecasting system may be exposed to a number of risks. The leadership considers the following potential risks are to be taken into consideration and diminished:

–**Technical risks**: the systems approached in this paper rely on technology, such as data mining, search engines, data-gathering, software applications that render information in a visual format, and web tools. Basically, these tools are different technologies which are present on a daily-basis in our lifes, but it is important to develop a sturdy and trustworthy system which can integrate all these different tools which can be a tough challenge even for an experienced technologist.

–**Data risks management:** the quality of production depends largely on the quality of inputs. Operators must ensure that biases are balanced or minimized at the various stages of data collection and analysis approaches. Data must be collected from different sources to ensure representativeness of different types of data technologies and expected impacts. Specialized sources must be qualified and close attention should be paid to choice among different data sources.

–**Security risk management**: Nowadays, malicious attacks are hampering towsands of systems everyday, for this reason the system ought to be protected from a wide-range of malicious attacks, including intentional distortion, data corruption, data tampering, data implantation, and data

manipulation, information and rejection of service attacks. The system, particularly the public education part, needs to be designed with adequate security, monitoring and analysis tools.

– **Risks of disruptive ideas**: as with numerous disruptive technology calculations, *"there can be a natural tendency to leave wild or challenging ideas impossible or highly improbable based on knowledge, trends and understanding at the time of prediction"* (Roberts, 2021). It is important that all predictions are recorded for forthcoming use in case of shifting opinions or facts.

– **User risk policy**: undoubtedly, the user is exposed to several risks: the system may suffer due to lack of sufficient participation; malicious users may damage the system; operators may publish information that is not publicly available; there could be a failure of having too much diversity inside the public users, resulting in a prejudiced forecast.

– **Financial risk:** Building a sustainable forecasting system requires adequate and ongoing funding requires a diversified funding source that eventually would reduce the risk of failure caused by insufficient financial support.

– **Stakeholder risk:** *"The ultimate risk is that predictions made by the system are not used or are being rejected by stakeholders and decision makers inappropriately"* (Mojtahedi & Lanoo, 2017). This can be caused by several factors such as unfeasible forecast in which a forecast that does not adequately reflect possible future outcomes unable to make decisions from it. A prediction that is too general or doesn't understand the feature, predicting an irreplaceable outcome. Implausible prediction in which stakeholders find it difficult to accept a prediction worth considering doubtful or even unbelievable due to the fact that it can challenge existing mindsets. It is important that the more uncertain the forecast is, the more one should try to explain how another future could arise in a certain time. Maps and scenarios are also important tools that can be used for mitigation.

– **Misuse of forecast**: One that predicts such forecasts should be careful when using optional parts of the prediction, supporting a conclusion that is different from the intent of the prediction. *"The forecasting planners must, if possible, review how the forecast and its conclusions are being used by stakeholders and decision makers"* (Vinodhini et al, 2021).

3. Conclusions

Nowadays there are countless resources for developing forecasting systems to counter disruptive technologies and applications, but it must be stressed that each model will have its strengths and weaknesses. In order for a forecasting system to be taken into consideration in the MDMP, it should exploit the wide-ranging active and passive data-collecting techniques utilized in the intelligence cycle model and then to use the data to create roadmaps of potential scenarios with signals and signposts resulted from data inputs.

A system should contain some important functions in order to be reliable such as: needs definition, gathering and creating alternative futures, roadmapping, tracking, engagement, and providing feedback to the decision maker. An effective forecasting system should always look for a wide range of alternatives to improve its performance. To achieve this, it is necessary to use both traditional forecasting approaches, such as military workshops, meetings, expert interviewers and novel approaches such as crowdsourcing, war-gaming, data mining, and simulations.

These scenarios, focusing on alternative futures, could determine the impact of disruptive change on the selected military environment, identify the preconditions necessary for disruption to

occur, the type of technologies and applications that could help counteract disruption, and, last but not least, identify what the source and cause of the disruptive technology might be. In conclusion, these alternative forecasts should be able to improve the quality of decisions made by military planners and their commanders. A useful forecast would demonstrate how each scenario of the alternative future could evolve from the present, contributing to a "big-picture" which highlights the events that could occur at a given time and what the outcome would be.

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