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SHAPING THE DATA ANALYTICS ENVIRONMENT TO PROMOTE ARMY-WIDE ADOPTION

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PROMOTE ARMY-WIDE ADOPTION**

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AIM

1. The aim of this paper is to explore ways to better integrate the use of data and analytics in the day-to-day running of operations in order to better support decisions.

2. Focus will be given to decisions taken at the Army L1 (Operational/Strategic) level. However, data analytics decisions taken at that level are closely interrelated with the use of data at the tactical level. This is a factor of both the connected nature of data and the future operating reality of operations.

3. Bottom line up front. To improve data management and the use of analytics products at the operational level these tools need to be used all the way to the edge of the decision-making system. For this, an environment must be created to promote the use and integration of data analytics. Two conditions must be met:

- a. resources must be made available to conduct the work associated with data analytics; and,
- b. barriers need to be lowered and rules alleviated to render the use of data analytics easy.

INTRODUCTION

4. In this age of rapid technological change, organizations must constantly monitor their environment and performance to be able to rapidly adjust and remain competitive.¹ Here, the use of data and analytics can be leveraged to produce this agility as it can support decision makers in a descriptive, diagnostic, predictive and prescriptive way. In fact, Maj Atkins calls for a change in how the military organizes analytics to be better positioned to face the challenges of the emerging battlespace.² This is further emphasized in *Strong, Secure, Engaged* noting that “modern militaries rely on networks and data to plan and carry out missions” and underlying the greater emphasis on data analytics in the future of defence.³ Although many modern businesses are by design deeply intertwined with data analytics, this is a relatively nascent sector for the military. Furthermore, the military, as other enterprises that predate the Internet, needs to undergo changes in strategic assumptions to move from the analog to the digital age.⁴

5. To explore methods of data integration in decision-making, the decision itself will first be looked at, to clearly see the benefits of the use of data. Then, links will be made with future land operation doctrine and command theory to better highlight how data can be used at the proper place to enable better decisions for the system as a whole. Of course, data analytics theory will be linked in to demonstrate how it can benefit doctrine. Finally, actions at the operational level

¹ Anil Maheshwari, *Data Analytics Made Accessible: 2021 Edition*, n.d., 15.

² Sean A. Atkins, “Multidomain Observing and Orienting: ISR to Meet the Emerging Battlespace,” *Air & Space Power Journal* 32, no. 3 (Fall 2018): 40.

³ Canada and Department of National Defence, *Strong Secure Engaged: Canada’s Defence Policy.*, 2017, 55.

⁴ “The Digital Transformation Playbook: Rethink Your Business for the Digital Age (Audible Audio Edition): David L. Rogers, Paul Heitsch, Tantor Audio: Amazon.ca: Audible Audiobooks,” 7, accessed February 7, 2021, https://www.amazon.ca/Digital-Transformation-Playbook-Rethink-Business/dp/B07J5KZJ48/ref=sr_1_2?dchild=1&keywords=The+Digital+Transformation+Playbook+Rethink+Your&qid=1612721646&sr=8-2.

will be discussed to underline ways to foster the use of data from the top to the edge of the system.

DISCUSSION

Decision

6. Command is arguably the most important of the Canadian Armed Forces' (CAF) five operational functions. It is the glue which enables the other operational function to perform properly. At the core of the command function is a decision. This is clearly emphasized in the third part Observe, Orient, Decide, Act (OODA) loop concept. However, a decision is needed even earlier as a commander must first decide where to observe before the loop even starts. Decisions are important and the military allocates great amounts of energy to leaders with knowledge and experience to excel in this function. However, Bazerman and Moore are disturbed by the fact that deciders are most often rewarded for the result of their results rather than for taking good decision through a good process.⁵ Because decisions involve uncertainty, deciders have taken decisions for wrong reasons but have had good outcomes for which they have been rewarded. This perpetuates a flawed decision logic throughout the system. It is normal as humans are not perfect machines but rather riddled with behavioural biases which must be mitigated. To improve decision quality, Bazerman and Moore suggest the use of decision-analysis tools such as linear models since they can be programmed to “sidestep biases that are known to impair judgment.”⁶ Taking this into account, it is possible to see the importance of data analytics in the decision-making process as a whole. As such, a decision badly taken at the

⁵ Max H. Bazerman and Don A. Moore, *Judgment in Managerial Decision Making* (New York, 2013), 229.

⁶ Bazerman and Moore, 208-209.

operational level will evidently have detrimental effects at the operational level. However, tactical deciders must be taken into account as well since these will also have operational effects. Not enabling data-based decisions at lower levels will increase the probability that bad deciders move up the chain to reach the operational level and may even cause data use aversion throughout the organization. Thus, to improve the use of data analytics of the army it is important to allow access to decision-analysis tools not only at the operational level, but all the way to the edge of the system as well.

Dispersed Operations

7. The use of data analytic to the edge is further reinforced by the Canadian Army's (CA) vision to employ adaptive dispersion defined as "the ability to operate widely dispersed yet retain the ability to aggregate rapidly to concentrate combat power to attain goals."⁷ The dispersion of small teams over the battlefield highlights the unique and isolated nature of the decisions they will need to take. Furthermore, this type of operation requires a high level of authority at the dispersed site and thus increased delegated authority.⁸ This in turn augments the importance of those decisions and brings them closer to having an operational impact. Thus, the use of analytics is further reinforced at the edge to ensure the decisions made are of quality.

8. Adaptive dispersed teams are synonymous to agility which is described as being key in the CAF's capability to conduct operations internationally as well as at home.⁹ One of the main

⁷ National Defence Government of Canada, "Advancing with Purpose: The Canadian Army Modernization Strategy," January 7, 2021, 15, <http://www.army-armee.forces.gc.ca/en/news-publications/canadian-army-modernization-strategy.page>.

⁸ David S Alberts, "Agility, Focus, and Convergence: The Future of Command and Control," n.d., 12.

⁹ Canada and Department of National Defence, *Strong Secure Engaged*, 57.

objectives of the CAF's enhanced data strategies is increased agility.¹⁰ Agility can be described as the “ability to be effective in the face of a dynamic situation” and has the attributes of responsiveness, flexibility, innovation and adaptation¹¹. The effective use of data analytics can greatly improve responsiveness since a descriptive display of the information relevant to a situation, in a dashboard for example, can considerably diminish the time needed to analyze it and respond to it. Furthermore, flexibility, innovation and adaptation can also benefit from the diagnostic, predictive and prescriptive nature of analytics. This reinforces once more the use of analytics not only at the top, but also at the edge of the system.

Data and Analytics

9. The demonstration of the usefulness of data analytics for decision makers has now been made. Along with this comes the realization that, to properly institutionalize the use of analytics, the products, tools, and resources associated with it must be made available to the entirety of the decision-making system; all the way to the edge. It is now appropriate to dive deeper into the data world to understand how to better integrate it.

10. Analytics entails the “computational transformation of data into insights.”¹² It is dependent on strong data management processes (quality, security, architecture, etc.) and a wide variety of data sources and data types.¹³ As discussed earlier, it can provide insights in a descriptive, diagnostic, predictive and prescriptive way which are increasing in value but in

¹⁰ National Defence, “The Department of National Defence and Canadian Armed Forces Data Strategy,” report on plans and priorities, aem, December 3, 2019, 8, <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/data-strategy.html>.

¹¹ Alberts, “Agility, Focus, and Convergence: The Future of Command and Control,” 23.

¹² Data National Defence Innovation, Analytics, “ANALYTICS IN DND/CAF Vision and Guiding Principles” (ADM DIA, July 2020), IV.

¹³ National Defence, 5-6.

difficulty as well (Figure 1). At the operational level, the descriptive (what happened?) and the diagnostic (why did it happen?) analytics are the most likely to be used.



Figure 1. Analytics maturity curve¹⁴

Data Democratization

11. To be able to utilize data analytics effectively, held analog information must first be converted to digital format as per the Vice Chief of Defence Staff’s priority. However, it also requires accessibility to information from the top level down to the very edge. The principle of data democratization indicates that “everybody has access to data and there are no gatekeepers that create a bottleneck at the gateway to the data.”¹⁵ This implies complicated task of eliminating the stovepipes of the different departments of the Army and the CAF. However, in a

¹⁴ National Defence, 2.

¹⁵ Bernard Marr, “What Is Data Democratization? A Super Simple Explanation And The Key Pros And Cons,” Forbes, accessed February 7, 2021, <https://www.forbes.com/sites/bernardmarr/2017/07/24/what-is-data-democratization-a-super-simple-explanation-and-the-key-pros-and-cons/>.

more fundamental way, it implies the much more accessible task of reducing the rules surrounding data access and treatment.

12. The CA's information management is based on a need to know that hinders use of data to gain insights. For example, to gain access to Defence Resource Management Information System (DRMIS) a form requiring many different levels of authorization causing delays in information access. This barrier may also dissuade an edge entity from developing an accurate analytic tool. These barriers are also present in the Military Administrative Support System (Monitor MASS) where internal modification of the order of battle (ORBAT) is not permitted and the management of soldiers outside the unit is difficult. However, the rapidly changing environment causes units to adapt their force structure to the task. Since Monitor MASS does not permit such a flexibility, units often resort to tracking their resources on an Excel spreadsheet. This prevents the unit from gaining insights from a proper analytics tool, and also misrepresents the resource in the data used for analytics at higher levels.

13. To be clear, data democratization is in direct opposition to advancing with purpose when it states that "leaders must be selective regarding those that receive access to systems of record, and they must further ensure proper training on these systems."¹⁶ Putting up barriers to access is synonymous to preventing analytics advantages to edge deciders and reducing data quality of the database. Both of which are detrimental to the agility required for future operations. Each group needs to be able to visualize the data as they want to gain their insights.¹⁷ That must happen from the shared data to ensure a common operating picture and insights elsewhere in the system.

¹⁶ Government of Canada, "Advancing with Purpose," 49.

¹⁷ GEORGES GARDARIN, *BASES DE DONNÉES* (EYROLLES, 2003), 25.

Resources

14. Once barriers are lowered, it is easier to allocate resources to the integration of analytic tools. Although the technological side of data analytics might provoke the reflex to employ an industry expert such as Microsoft to create a solution costing large amount of money, this is not what is proposed by this paper. The combination of people and time is what is recommended. This is not in the sense of adding additional human resources to a unit, but rather freeing up some time to allow some designated soldier to develop analytic tools. The contrast with industry experts is made on purpose to underline the unexploited potential of CA soldiers and particularly the younger tech savvy generations. Prior to the arrival of Monitor MASS, a soldier from the 2nd battalion of the Royal 22e Régiment had developed a database of similar functionality, but with much more liberty of action. This soldier had learned to code this database from Google searches yet was able to tailor dashboard to companies. This database was dropped to the benefit of Monitor MASS, but many of the deciders were disappointed of the loss of tailored descriptive analytics. Another similar example occurred at around the same time at the 2nd division training centre. In this case, however, they kept their database in parallel to Monitor MASS to prevent the loss of the key capabilities they had created. In both cases, the homemade databases were isolated at the unit; they were not linked to CA or CAF data. With lower boundaries and freed up resources, it would be possible to see the reemergence of the “data analytics corporal” enabling insight not only at the edge this time, but throughout the system because of permitted connectivity.

15. In 2020, the Australian Army in partnership with With You With Me trained army reservist clerks in data engineering.¹⁸ They were able to build data analytics models and dashboards to the desires of the commanding officer enabling him to better manage his finances. Although it did cost \$1,250 per user to train, it is negligible compared to the average \$280,000 charged by consulting companies for similar projects.¹⁹ This speaks to the untapped potential that could be used to integrate the CA use of data analytics.

Design Thinking

16. Top-down implementation of data analytic tools is probably not going to provide a perfect solution for all. In fact, it will probably not provide a good solution for most. However, having freedom of action and simultaneously developing multiple tailored solutions at the edge will augment the probability of finding a good general solution. This will be largely because decentralized creativity and innovation will have been enabled. This environment will create the conditions in which the iterative cycle of human-centred design thrives. This cycle is characterized by the steps of observation, idea generation, prototyping and testing and based on the double-diamond model of design (Figure 2).²⁰ Because of a larger population designing analytic tools there will be a larger divergence in thinking thus increasing the chances of finding the right questions to ask the data and creating better tools to display them.

¹⁸ WYWM, “Reimagining Training - Retaining - Recruiting - Australian Case Study for WYWM Potential Platform,” n.d., 5.

¹⁹ WYWM, 2–5.

²⁰ “The Design of Everyday Things: Revised and Expanded Edition: Amazon.ca: Norman, Don: Books,” 221, accessed February 7, 2021, https://www.amazon.ca/Design-Everyday-Things-Revised-Expanded/dp/0465050654/ref=sr_1_1?crd=O6FQQHUTFCOL&dchild=1&keywords=the+design+of+everyday+things&qid=1612753772&s=books&sprefix=the+design+of+e%2Cstripbooks%2C157&sr=1-1.

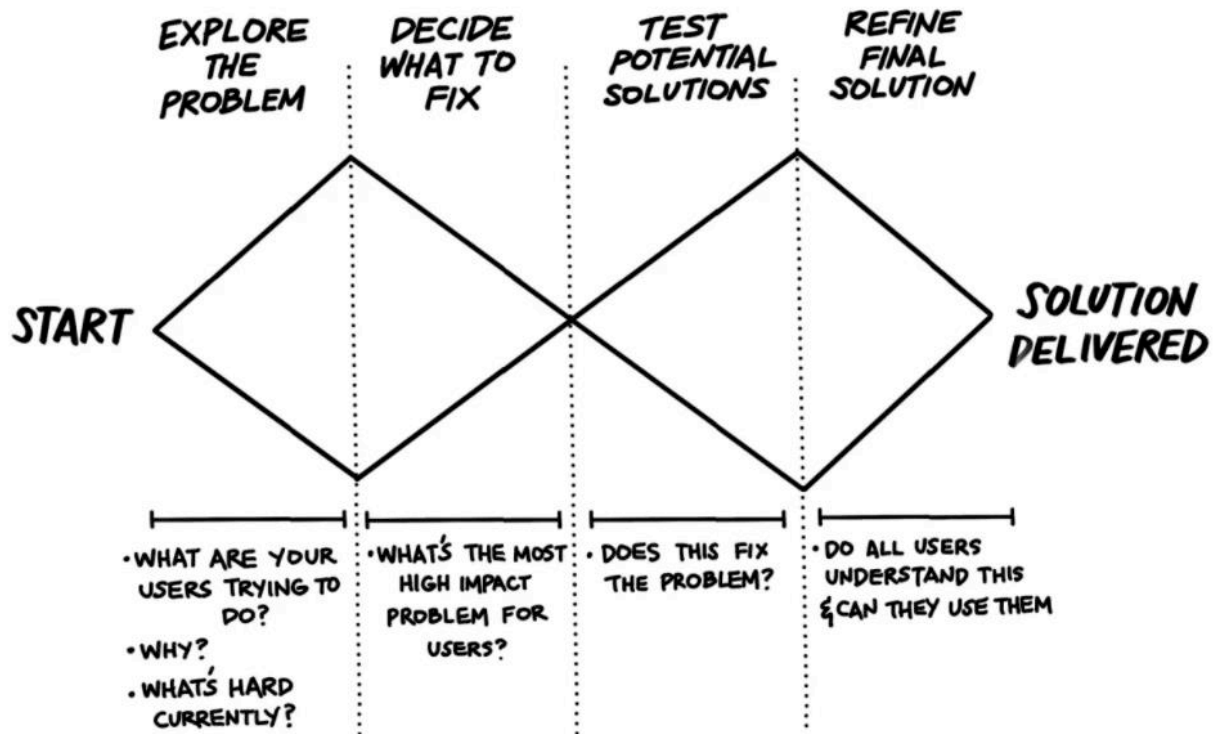


Figure 2. The double-diamond model of design²¹

CONCLUSION

17. This paper aimed to explore means to achieving better integration of data and analytics into the decision-making process of CA-wide deciders. It was clearly demonstrated that decision quality increases with the use of data analytics. In fact, without tools like linear modelling biases continue to have a strong impact on human judgment. Furthermore, the dispersed nature of future land operation and the strong requirement for agility emphasizes the need to have good quality decisions at all levels. Because power is pushed to the edge data analytics must be pushed there as well. To achieve this data democratization is required and information must be available to all

²¹ "How To Run The Right Kind Of Research Study With The Double-Diamond Model," Smashing Magazine, <https://www.smashingmagazine.com/2020/05/research-study-double-diamond-model/>.

deciders to interpret and analyze at will. For this to happen, accessibility rules must be alleviated and human resources at the edge must be freed up and allowed easy access. Together, these conditions will enable design thinking and augment divergence in both problem identifying and problem solving. This will undeniably augment the effectiveness of the CA decision-making system as a whole.

RECOMMENDATION

18. The land operations effects framework suggests commanders should shape the battlespace to create the conditions for decisive action.²² Similarly, to increase the institutionalization of data analytics, the CA must shape the environment to set conditions in which data analytics naturally occurs. Two steps are recommended. First, resources must be made available to conduct the work associated with data analytics. Second, barriers need to be lowered and rules alleviated to render the use of data analytics easy. These two circumstances together will lay the path to data analytics integration that deciders should naturally follow.

²² Canadian Army, "B-GL-300-001-FP-001 (2008) LAND OPERATIONS," 2008, 4–26.

BIBLIOGRAPHY

- Alberts, David S. "Agility, Focus, and Convergence: The Future of Command and Control," n.d., 32.
- Atkins, Sean A. "Multidomain Observing and Orienting: ISR to Meet the Emerging Battlespace." *Air & Space Power Journal* 32, no. 3 (Fall 2018): 26–44.
- Bazerman, Max H., and Don A. Moore. *Judgment in Managerial Decision Making*. New York, 2013.
- Canada and Department of National Defence. *Strong Secure Engaged: Canada's Defence Policy*, 2017.
- Canadian Army. "B-GL-300-001-FP-001 (2008) LAND OPERATIONS," 2008.
- Defence, National. "The Department of National Defence and Canadian Armed Forces Data Strategy." Report on plans and priorities. aem, December 3, 2019. <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/data-strategy.html>.
- GARDARIN, GEORGES. *BASES DE DONNÉES*. EYROLLES, 2003.
- Government of Canada, National Defence. "Advancing with Purpose: The Canadian Army Modernization Strategy," January 7, 2021. <http://www.army-armee.forces.gc.ca/en/news-publications/canadian-army-modernization-strategy.page>.
- Smashing Magazine. "How To Run The Right Kind Of Research Study With The Double-Diamond Model." <https://www.smashingmagazine.com/2020/05/research-study-double-diamond-model/>.
- Maheshwari, Anil. *Data Analytics Made Accessible: 2021 Edition*, n.d.
- Marr, Bernard. "What Is Data Democratization? A Super Simple Explanation And The Key Pros And Cons." *Forbes*. Accessed February 7, 2021. <https://www.forbes.com/sites/bernardmarr/2017/07/24/what-is-data-democratization-a-super-simple-explanation-and-the-key-pros-and-cons/>.
- National Defence, Data, Innovation, Analytics. "ANALYTICS IN DND/CAF Vision and Guiding Principles." ADM DIA, July 2020.
- "The Design of Everyday Things: Revised and Expanded Edition: Amazon.ca: Norman, Don: Books." Accessed February 7, 2021. https://www.amazon.ca/Design-Everyday-Things-Revised-Expanded/dp/0465050654/ref=sr_1_1?crid=O6FQQHUTFCOL&dchild=1&keywords=the+design+of+everyday+things&qid=1612753772&s=books&prefix=the+design+of+e%2Cstripbooks%2C157&sr=1-1.
- "The Digital Transformation Playbook: Rethink Your Business for the Digital Age (Audible Audio Edition): David L. Rogers, Paul Heitsch, Tantor Audio: Amazon.ca: Audible Audiobooks." Accessed February 7, 2021. https://www.amazon.ca/Digital-Transformation-Playbook-Rethink-Business/dp/B07J5KZJ48/ref=sr_1_2?dchild=1&keywords=The+Digital+Transformation+Playbook+Rethink+Your&qid=1612721646&sr=8-2.
- WYWM. "Reimagining Training - Retaining - Recruiting - Australian Case Study for WYWM Potential Platform," n.d.