ENTERPRISE RESOURCE PLANNING AND MANAGEMENT

BST825
INDIVIDUAL REPORT

CRITICAL SUCCESS FACTORS IN ERP IMPLEMENTATION & ERPSIM REFLECTION

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Student Number: C21084397

Word count: 3291 /3000+-10%

Submission Date: 7th May 2025

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Contents

Introduction

This report is divided into two sections. Section one analyses Bombardier's ERP experience, identifying and justifying critical success factors (CSFs) for successful implementation. With the global ERP market projected to reach $100 billion by 2026 (***Figure 1***), and up to 75% of ERP projects failing, identifying these CSFs is essential to mitigating costly implementation risks (Deloitte, 2016).

Section two critically reflects on ERPsim sessions undertaken during the module. Five teams competed across three consecutive sessions to manage a virtual cereal manufacturer in Germany using a make-to-stock strategy. The reflection explores decisions made under pressure, lessons learned and debates a future strategy for improvement.

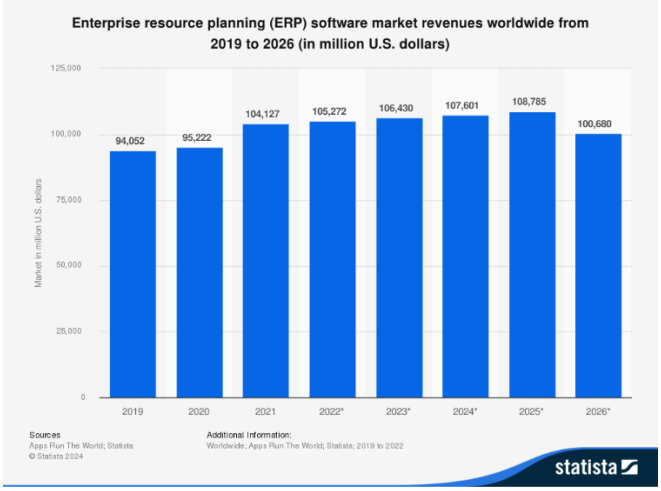


Figure 1: ERP Market Revenues (Statista, 2024)

1. Critical Success Factors in ERP Implementation

TABLE 1:

SUMMARY OF ERP CRITICAL SUCCESS FACTORS

Category	CSF	Justifications
People	**Top Management Support**	Strong leadership and a compelling vision provides an opportunity to convince employees the need for change providing direction and aligns resource commitment towards one goal. Without it projects drift with no direction and resistance grows.
	Employee Education & Training	Resistance is also technical. Employees must possess the right fundamental knowledge to operate the system. This builds confidence which further reinforces adoption and avoids costly errors.
Process	**Deployment strategy (Gradual Implementation)**	Organizations must decide the right deployment strategy aligned with its resource commitments, risk levels and operations. A aggressive strategy risks overburdening employees confusing them and leading to poor long term adoption. Alternatively a slower strategy is time consuming and can be expensive, requiring dual system maintenance and licensing costs of both ERP and Legacy systems over a prolonged period
	Pre-Testing and Hypothetical Simulation	Testing systems before launch helps find early problems and misalignment, avoiding expensive failures or downtime when the system is operational
Data	**Data Compatibility & Cleansing**	ERP's main objective is to provide adequate information for decision making, data inconsistencies can result extensive miscalculations. Clean accurate data therefore enhances users confidence within the system and experience fewer operational inefficiencies and challenges in the future
Change Management	**Dedicated Change Management team**	Change management team ensures smoother sustained adoption by taking direct responsibility for the project's success, guiding employees through the transition, and swiftly solving potential issues. A continuous and proactive approach to monitoring, feedback loops results in higher employee satisfaction and engagement operating the system.

Figure 2

People

Competent leadership is a foundational CSF as it directly drives and aligns strategy and resource commitments towards a shared end goal during periods of change (Markus, 2000; Motwani, 2005). Bombardier's VP of operations employed a "One Company" approach to eliminate the 63 legacy systems and inconsistencies across 13 sites (Aubert, 2012). A primary driver for ERP adoption is to dismantle silo communication problems, where departments operate in isolation and pull in separate directions due to non-integrated communication (Wang, 2005). Overcoming these established silos requires sustained leadership to unify the organisation under one cohesive strategy. A lack of leadership leads to coordination breakdowns where projects drift without clear purpose or direction (Nah, 2003; Gargeya, 2005).

It is equally important to communicate a vision. ERP often requires a fundamental cultural shift where processes are re-engineered, not just a system replacement. Communicating a strategic purpose behind change fosters an opportunity to convince employees to "buy in," informing on why change is needed and placing urgency (Kotter, 2012). Recent research by Ruff (2025) indicated that employee involvement could increase change success by up to 24%. Despite superior system functionalities, Bombardier's previous failed ERP implementation showcases the danger of a top-down imposition that led to resistance, highlighting the consequences of neglecting employee-level involvement within change processes (Klaus, 2010).

However, resistance to change is not only psychological but also practical. Employees must possess the technical know-how to operate the system (Gargeya, 2005). Implementing a structured role-based training experience is essential to reduce costly errors or abandonment due to frustration (Al-Mashari, 2003). Bombardier conducted 102 sessions for 1,400 employees, but the content was too complex and overwhelmed users. Training should be practical and role-specific, aimed at building users' confidence to make better day-to-day decisions.

Nonetheless, support should extend past initial implementation. At the Mirabel facility, prematurely ending post-go-live support led individuals to revert to systems they understood, jeopardising sustained adoption (Somers, 2001; Aloini, 2007). ERP issues often arise after the honeymoon phase, which can take months after launch, when real operational pressures and frustrations accumulate (Mahmood, 2019). Overreliance on underprepared internal trainers over a prolonged period overburdened them with questions they couldn't resolve, weakening users' confidence with unanswered questions (Aubert, 2012). Outsourcing the education provision alongside internal staff could have ensured adequate support, reducing the pressure during this critical phase.

Process

Beyond training, successful ERP implementation also depends on identifying an appropriate deployment strategy that is aligned with the organisational culture, size, operational requirements and industry complexities (Holland, 1999). The strategy

should reflect the organisational resource commitments and risk tolerance (Bahssas, 2015). If the deployment is too aggressive, it can overwhelm users, directly affecting their confidence and leading to higher resistance (Yusuf, 2004). Conversely, a cautious deployment prolongs implementation and increases unnecessary costs of operating a dual system (Parr, 2000).

Bombardier utilised a phased rollout starting at the Mirabel plant, minimising risk and allowing for adjustments before broader implementation. The organisation benefited from experiential learning and ensured bottlenecked resources of support personnel were not overwhelmed, focusing on issues at a single facility at a time (Aubert, 2012). Despite this, phased rollouts are not universally applicable and are more appropriate in complex, international organisations where early functionalities often need adjustments (Dunaway, 2012). Additionally, full deployment took approximately five years, emphasising the long-time horizon required for slower implementation (Dunaway, 2012).

Another CSF validates the system's performance and reliability through pre-testing and hypothetical simulations. This ensures alignment between the ERP functionalities and the business processes, helping to uncover potential failure points. Umble (2003) suggests insufficient testing is a common cause of ERP failure, as undetected errors can propagate into significant issues post-implementation. In Bombardier's case, extensive testing was conducted for their inventory management processes to verify process reliability, critical as it accounted for 75% of their manufacturing costs (Aubert,

2012). Pre-testing in controlled environments reduces the chances of a system crash or an update causing disruptions, with potential losses estimated to average $8.5 million hourly (Statista, 2020).

Data

ERP's main objective is to provide adequate interconnected information to strengthen decision-making. Yet, without accurate data, even a well-tested ERP system will produce inaccurate insights. Bombardier dedicated a team to cleansing historical records and was responsible for extracting, consolidating, cleansing and verifying the data before uploading it to the SAP system (Aubert, 2012). Inaccurate data can cause miscalculations, significantly undermining user trust, and often result in employees returning to systems they know worked and trusted (Monk, 2012). This is especially vital within high-stakes manufacturing, such as aviation, where a single error within an engineering blueprint or assembly record can result in serious operational failures or even potentially jeopardise the lives of others (Somers, 2003; Hong, 2002).

While this case was published over a decade ago, Bombardier relied heavily on manual processes. A potential solution is integrating AI-driven validation, which can enhance data accuracy by up to 70%, significantly reducing the manual burden (Chung, 2019).

Change Management

A dedicated change management team is essential for sustaining ERP adoption. Bombardier constructed a 50-member BMIS team of a 10:1 ratio of senior staff to specialised consultants, ensuring internal business operations were prioritised (Aubert, 2012). Acquiring the right mix of consultants and department expertise ensured issues were addressed through technical and contextual understanding (Aladwani, 2002; Kotter, 2012). This balance helps further reduce resistance, as employees often perceive consultants as critics lacking organisational-specific knowledge, a judgment linked to lower trust levels (Doeze, 2022).

However, reliance on reports or audits may not reflect how operations are actually conducted. Unannounced facility visits can provide valuable insight into day-to-day practices (Somers, 2004). These visits also allow employees to give feedback on issues and potential improvements, offering an opportunity to strengthen system capabilities and implement features that outperform legacy systems (Mabert, 2003; Sarker, 2003).

2. ERP-Sim Reflection

Session 1 - Pricing & Marketing

I took an active role in monitoring inventory performance, overlooking downstream procurement and production operations, ensuring stock was within respective limits to ensure continuous production and avoid the additional holding cost. Additionally, I inferred changes in finished goods and communicated product availability upstream to sales and marketing managers. Despite starting the session with large amounts of finished goods, our team decided to start production, opting for a high volume and sales approach to maximise revenue. We deliberately allowed the simulation to initially run on its default settings to observe market dynamics and identify baseline consumer demands.

Our group started strong, achieving second place with a company valuation of $98,661. Despite initial stock, the decision to produce enabled us to achieve substantially higher productivity of 80,000 units, further supporting our leading sales volume. However, to ensure the additional products would sell, we were forced to decrease the price further to simulate the additional demand required. Consequently, this led to a low net margin of only 45%, which was further worsened by overspending on the marketing side. Despite strong early progress, not recognising profitability issues would prove a fundamental flaw we did not recognise early enough.

Lessons learned

Our pricing strategy was grounded in revenue maximisation theory without considering the long-term effects on profitability (Cabral, 2017). Analysing the game data, we observe a clear negative correlation of -0.75 between average price per unit and marketing expenditure (Appendix 1). This suggests that for slow-moving products, we consistently reduced price while simultaneously increasing marketing expenditure, inevitably providing the same stimulus but compressing our margins further (Talluri, 2004). Conversely, for fast-moving items, we would increase price and reduce marketing, which just weakened the demand stimulus, making products harder to sell (Nerlove,1962). Implementing both actions simultaneously made it difficult to isolate their effect. Even though increasing output raises revenue, this only holds true to a certain point. Once marginal cost of additional units, including procurement, production and marketing approaches or exceeds marginal revenue, overall profitability starts to decline (Pindyck, 2018). Our team failed to realise that we had passed the inflexion point of optimal production and continued to invest aggressively, overlooking diminishing returns.

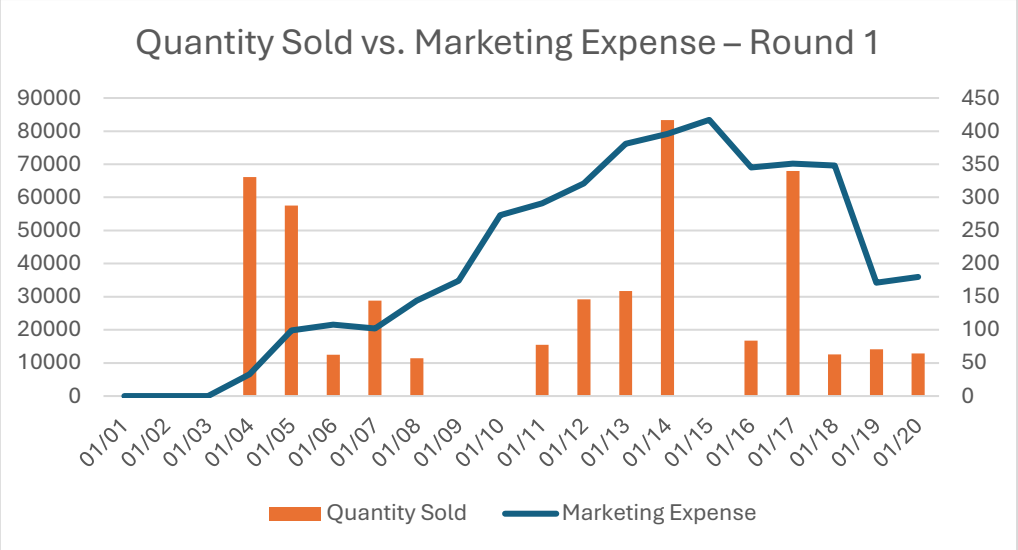


Figure 3

Despite heavy marketing investments, ***Figure 3*** reveals the ineffectiveness of our strategy. In the simulation, consumers lack brand loyalty, and the impact of marketing is short-term (ERPsim, 2021). Under the Nerlove-Arrow model, we can assume advertising goodwill resets each period (δ = 1) (Nerlove,1962). We acted accordingly, continuously marketing each round to sustain goodwill. However, marketing was applied uniformly across all regions regardless of demand patterns. This untargeted approach proved expensive and inefficient, as large spikes in marketing failed to translate into consistent sales despite inventory at reasonable prices.

Improved Strategy

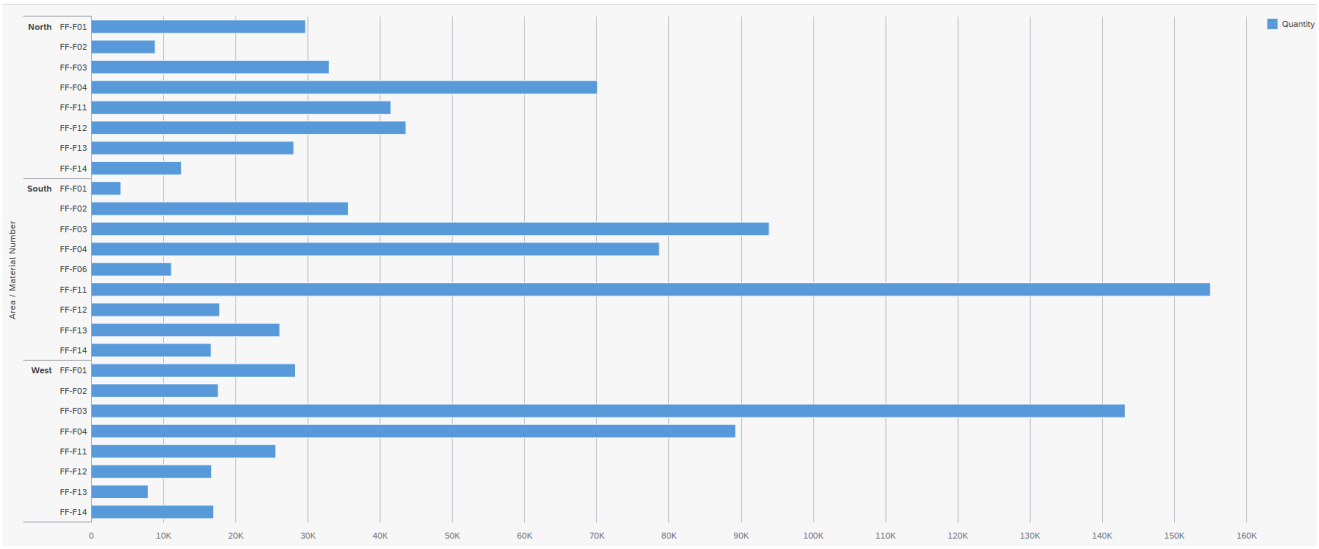


Figure 4: Total Sales by Region (ERPsim, 2025)

A more effective strategy would be to treat pricing and marketing as distinct, independent variables. By controlling one variable at a time in isolation, it would reduce further compression of our margins and provide us with clearer visibility to demand drivers (Kotler, 2019). For example, holding marketing constant and reducing price would have provided insights into price elasticity (Chevalier, 2003). However, as the simulation progressed rapidly, delaying combined demand drivers in favour of testing could reduce the group's responsiveness and competitiveness. While isolating variables improves information clarity, it risks underreacting to demand shifts, especially if competitors react more aggressively.

Figure 4 further supports this, where significant variations in product-level regional sales emphasise weakness within our untargeted marketing strategy. This was not a

deliberate decision, but one bounded by rationality (Camerer, 1998). Our marketing manager was unaware that such information existed, resulting in decisions being made with incomplete information. Had the data been recognised, a more effective marketing split could have optimised our return on investment, targeting untapped markets while reducing expenditure in high-performing areas.

However, the ERP system does not provide information on consumer marketing preferences, which could lead to increased expenditures in markets where products are simply unwanted by consumers and neglect markets where consumer interests are higher (Kotler, 2019). Ultimately, an effective strategy should strike a balance between regional targeting and broad marketing coverage to ensure cost-effectiveness without compromising market reach.

Session 2 – Production, Procurement & Forecasting

We anticipated that round two would trigger an automatic replenishment order, we purposely maintained a lower inventory level, ensuring adequate warehousing space for the delivery. This placed us perfectly around our order-up-to level. Moreover, the group decided to focus on three products to reduce the frequency of the 8-hour production changeover times, maintaining the extremely high production strategy. Regular replenishment orders were placed to sustain production, mitigating raw material stockouts. Our pricing and marketing strategy remained similar as we thought the previous round's performance had been adequate.

Regardless, we finished last, with a sharp drop from the previous round and earlier competitions, where we had consistently placed within the top three. Our group was shocked. Despite our exceptionally high productivity of 93,000 units, focusing on volume output over profitability resulted in the lowest net margin of just 39%. As a result, even though our total sales were comparable to those of other teams, our round net income was significantly lower. This consequently left us with the lowest company valuation of $65,570. In hindsight, it became clear that our tunnel vision on revenue became counterproductive, leading us to overproduce beyond market demand, undermining financial stability significantly.

Lessons Learned

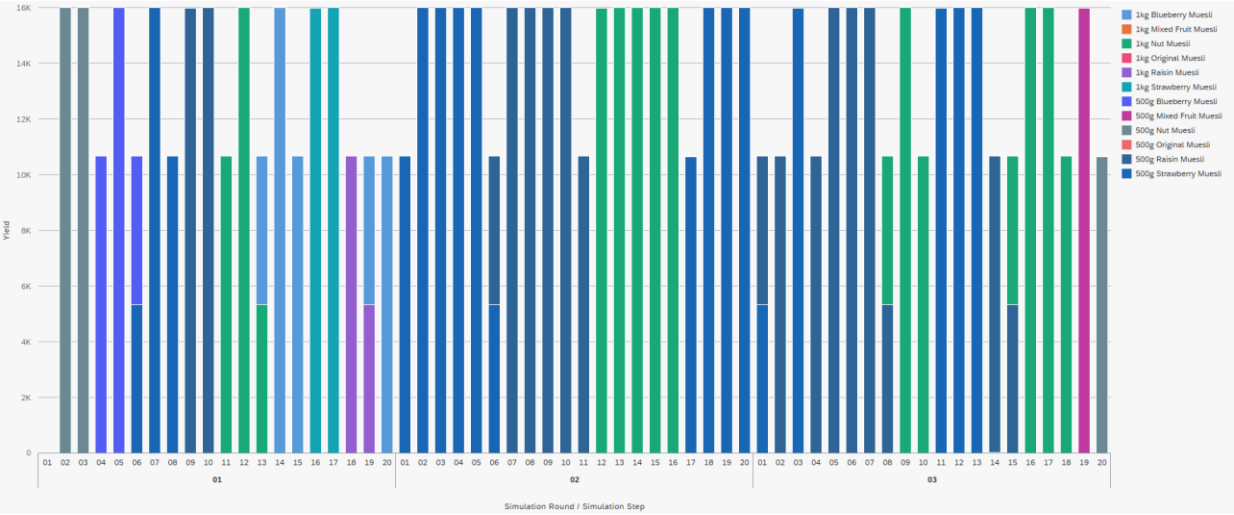


Figure 5: Production output (ERPsim, 2025)

Despite strategic failure, our procurement and forecasting systems were well executed. The issue was not with operations, but with a production-focused strategy misaligned with market dynamics. ***Figure 5*** demonstrates consistent strong performance within production, where we had outperformed other groups by a significant margin. The ability to achieve high production output was through lean principles (Liker, 2020), focusing on limited variety, eliminating the need to endure the non-productive 8-hour changeover time continuously and reducing the opportunity cost of sales from missed production (Womack, 1997).

To fuel continuous production, adequate raw materials had to be available. ***Figure 6*** illustrates the group's procurement decisions and overall inventory levels, applying the Order Up To (r, Q) policy where our batch constraint was 16,000, as that was the minimum we could produce at one time (Silver, 2016). By closely monitoring our total inventory, including Work-in-progress (WIP) within expected deliveries, reserved within production and net stock within the warehouse, we ensured full visibility over our material flow, which allowed us to make timely procurement decisions to avoid stockouts or exceeding the inventory holding limits (Chopra, 2019). Managing lead times was relatively straightforward as the games provided a generous inventory threshold, omitting item-level incremental holding costs or ingredient perishability (Blackburn, 2004). By maintaining a large safety stock, we established a robust buffer against lead time variability (Christopher 2016).

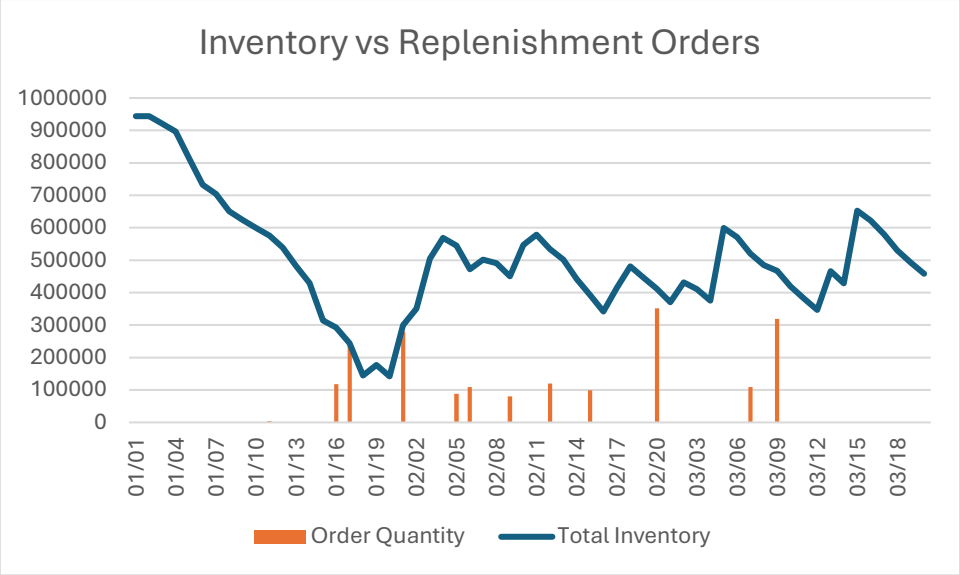


Figure 6:

Improved Strategy

A stronger strategy would be to produce a wider range of products. We overlooked product availability from the consumer's perspective, intentionally stocking out on most product varieties (Kwak, 2021). In the simulation where consumers lack brand loyalty and have many alternatives, a backorder cost would suggest a missed sale is substituted for competitors, rather than a delayed purchase (Iberopoulos, 2010).

Had we considered two or more additional SKUs, we would have also reduced our vulnerability to competition. By mainly focusing on three default products that other groups were likely also selling, it forced us into a price war that pushed our margins even lower (Porter, 1980). A broader product range diversified across different segments would have spread our risk, allowing stronger performing products to offset weaker ones if a price war emerged or demand fell sharply within a SKU (Hill, 2023).

Conversely, increasing product variety would suggest that we would endure more frequent production changeover times, reducing our overall output (Berry, 1999). But this would have likely been beneficial, moving us closer to the inflection point of optimal production, aligning us better with actual demand, rather than overproducing and artificially increasing demand through margin erosion (Slack, 2019).

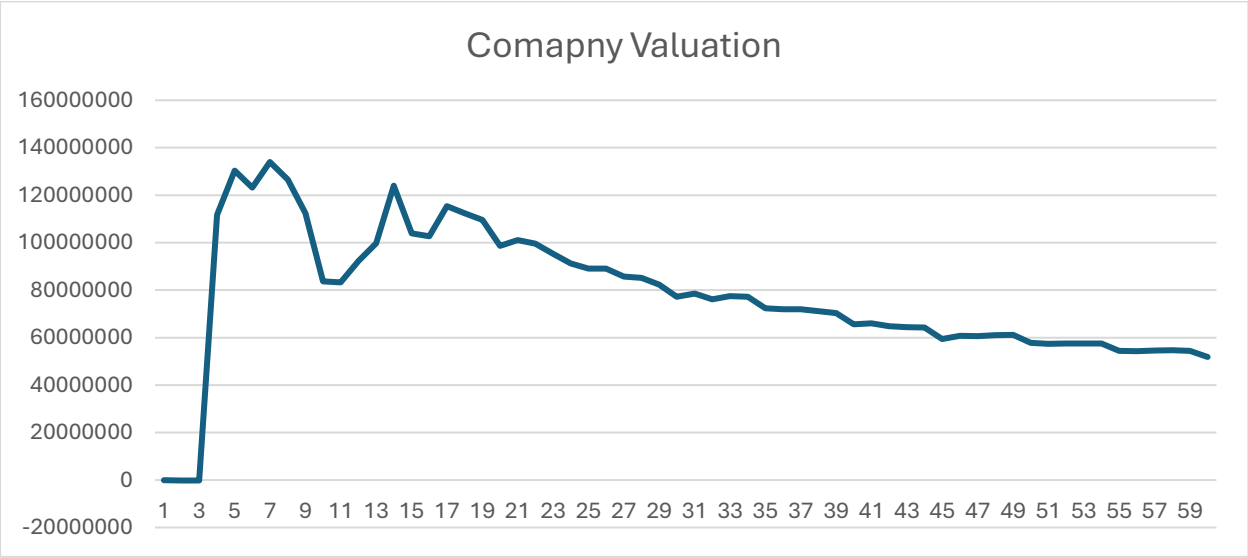
Session 3 – Decision-Making

It became evident that the volume-led strategy failed. We expected that by improving our profitability, we would increase our company's valuation. However, this assumption focused heavily on surface-level pricing and marketing, overlooking the core issue of overproduction. As a result, the group neglected to diversify the product range and continued to produce at extremely high rates. Only after realising that these changes had negligible effects on company valuation, we shifted focus to product variety. But the decision came too late, rather than recovery, it ultimately worsened our losses due to a large order that failed to translate into sales.

Our company valuation continued to fall, reaching $51,800, with cumulative net income significantly lower than competitors. Although we maintained high production levels of 84,000, both gross (60%) and net margin (36%) remained low. The consequences of overproduction became fully visible, as large frequent replenishment orders placed earlier were now due for payment. ERPsim’s 20-day payment delay meant that the

financial burden hit in round 3. Compared to group B, our liabilities were 4.5x higher, eroding our net margins further (ERPsim, 2021). This shows how prior decisions can create delayed but significant performance consequences.

Lessons Learned



Company Valuation

$$\text{Company Value} = \frac{\text{Annual Profit}}{\text{Market Risk Rate} + \text{Company Risk Rate (Company Credit Rating)}}$$

$$\text{Annual Profit} = \left(\frac{\text{Cumulative Operating Profit}}{\text{Number of Rounds Played}}\right) \times 12$$

Assumptions:

- **Market Risk Rate:** Always 7%.
- **Company Risk Rate:** Based on **Company Credit Rating**. The factors affecting credit rating are Net Debt (Receivables - Debt Loading). (But this is unrealistic as other factors can also affect the company risk rating.)

Source: (ERPsim, 2021)

Figure 7: Company Valuation

By analysing the game's data, all groups possessed the same simplified constant 7% market risk rate and held a AAA+ credit rating, meaning profitability was the only differentiator (***Figure 7***). Our poor performance directly reflected our inability to maintain profitability. However, in a more realistic scenario, the outcome would have likely been even worse. Focusing on a limited product range would have reduced our risk-bearing economies of scale, leading to elevated risk levels (Hennart, 2007; Damodaran, 2012).

Although our team of five communicated effectively and everyone tried their best, each person focused on optimising their department. Procurement ensured availability, production pursued volume, and marketing chased visibility. The absence of a shared direction reflects what Monat (2015) calls failure to system think. Departmental local gains pulling in certain directions at the expense of overall performance. This fragmentation led to siloed thinking, no one challenged the production volume assumption, and decisions were driven by departmental targets rather than a cross-functional strategic perspective (Norman, 2019). Much like Bombardier's case, success depends not only on superior systems but on a cultural shift towards a shared vision.

From a Cynefin framework perspective, we operated in confusion and chaos, reacting to symptoms rather than trying to identify the root causes (French, 2015). Facing declining performance, we defaulted to a trial-and-error approach that proved costly.

ERPsim simulated each day within a minute, and full information visibility was difficult. Under time pressure, we defaulted to intuition and habit, reflecting system 1 thinking. Without time for system 2 reasoning, we missed deeper underlying issues such as the delayed impact of suppliers' payments, reacting to change rather than reasoning (Kahneman, 2011). ERPsim is designed to reflect real-life decision-making environments, where time pressure, incomplete data and uncertainties are normal. In such settings, success often depends not just on functional execution but on understanding the system-wide consequences of those actions.

Improved Strategy

An improved strategy would be to adopt a simplified Orientation, discussion, decision and implementation (ODDI) framework to guide the team's interaction. This could have helped us step back, evaluate what the data is suggesting, and distinguish between what was happening and why, rather than reactive actions (Forsyth, 2014). Although we had around 10 minutes between each session, the time was used as a break rather than strategic reflection. Our discussions often overlooked orientation and discussion, with rushed decisions made without properly evaluating the data (Hernández, 2014).

The ERP's fast-paced and high-stress environment created perfect conditions for groupthink (Janis, 1982). No one critically questioned our fundamental strategy, and as a result, we fell into confirmation bias, repeatedly assuming that higher production would improve performance, despite data showing rising debt levels and falling margins (Parmley, 2006). An ODDI structured thinking process could have provided a brief

moment to reflect and counter these biases through cross-functional questioning, reducing siloed decision-making.

While a Decision Support System (DSS) could have improved data visibility, it risks shifting reliance on automated outputs (Lyell, 2016). ERPsim value lies in how teams experience the consequences of decisions and learn through active problem solving, not through system recommendations. DSS-generated suggestions could weaken this experiential learning process by removing the need for critical thinking and adaptive problem-solving (Aldrich, 2005).

The critical lesson is not to remove decision-making complexity, but to recognise the human judgment and behaviours under those conditions. A lightweight but structured ODDI framework would have provided the necessary structure to challenge those initial assumptions earlier through data interpretation, rather than persisting with a failing strategy across multiple sessions.

Conclusion

This report identifies critical success factors behind Bombardier's ERP implementation, emphasising the alignment of people, processes, and systems under a unified compelling vision for change. These factors ensure operational fit while recognising that people are at the heart of change, elevating success by reducing resistance and preventing reversion to legacy systems.

A key lesson from the reflection was our failure to critically question and recognise overproduction as the core issue. By exceeding the inflexion point, we inflated supply, forced aggressive price reductions and costly marketing to stimulate demand, ultimately compressing our net margins, leading to a poor company valuation. However, the simulation simplifies real-world complexities, including an automated MRP system and consistent market behaviours.

Beyond just improving technical performance, the simulation competition highlighted the importance of stepping back, reflecting, adapting under pressure and being self-aware of both personal and team biases. Critically questioning assumptions early and adjusting strategies quickly will be essential for future success within operations or leadership roles.

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Appendix

Calculations Created in LaTeX (Overleaf) and screenshotted

Appendix 1

Row Labels	Marketing Expense	Avarage Price per Unit			Correlation
01/01	0	#N/A		Round 1	-0.75297
01/02	0	#N/A			
01/03	0	#N/A			
01/04	33	4.42			
01/05	99	4.18			
01/06	108	4.40			
01/07	102	4.32			
01/08	144	5.00			
01/09	174	#N/A			
01/10	273	#N/A			
01/11	291	3.79			
01/12	321	4.05			
01/13	381	3.60			
01/14	396	3.49			
01/15	417	#N/A			
01/16	345	3.61			
01/17	351	3.38			
01/18	348	4.07			
01/19	171	3.77			
01/20	180	4.19			

Data used for -0.75 correlation

Figure 2 created by writer (C21084397)

Figures 3,4,5,6,7 Created from Excel game data or ERPsim game reports