Post-Pandemic Work Scheduling at a Pittsburgh-Based Engineering Office

BQOM 2521 – Decision-Making in Complex Environments

Summer 2021 Final Project – Alexa Bohn

University of Pittsburgh
Joseph M. Katz
Graduate School of Business

Contents

Abstract

The purpose of this project is to predict what the “new normal” work schedule should look like for the R&D workforce at a Pittsburgh metro-based organization. Using a BOCR ANP framework and the perspective of the director of engineering, four alternative work arrangements are evaluated: a full return to the office, a 50/50 hybrid schedule with mandated days, a 50/50 hybrid schedule with flexible days, and a fully flexible schedule. The results suggest that the best short-term and long-term results may be different, opening an interesting discussion for R&D leadership on the future of work and implications for organizational cultural norms.

Introduction

In February and March 2020, the COVID-19 pandemic abruptly shifted workplace norms across the globe. In the U.S., as state after state issued emergency shelter-in-place mandates, many corporate offices were forced to fully embrace telecommuting and working-from-home to continue normal operations. According to some studies, the percentage of U.S. adults working remotely for most of the workweek (3+ days) increased from 24% per-COVID to 53% post-COVID [1]. Other sources have the post-COVID percentage as high as 70% [2].

Fast-forward to mid-2021, the U.S. vaccination rate is approaching 70% nationwide and daily COVID case rates are at their lowest level since March 2020. As some semblance of normalcy returns to American life, employers and employees are looking ahead to what “the new normal” will be in corporate America [3]. Although the majority of U.S. office employees would want to work remotely even after the COVID-19 pandemic ends, companies are much more eager to bring their workforce back to the office in some capacity. In fact, in a survey of more than 350 CEOs and human resource leaders, 70% said they have plans to bring employees back to the office by fall of this year, if not sooner [4]. MSA—The Safety Company, a Pittsburgh-based manufacturer, is an example of a company targeting September 2021 for some kind of office re-entry.

MSA is a global leader in the development, manufacture, and supply of safety products. MSA’s products are used around the world in a variety of industries including industrial applications (oil & gas, construction, mining) and the fire service. Core strategic product lines for MSA include respiratory protection, gas and flame detection, head protection, and fall protection. MSA positions itself as a technology and innovation leader in safety product markets and has a large research and development (R&D) workforce.

The COVID-19 pandemic forced MSA’s R&D organization to work mostly remote in 2020 and so far in 2021. This was a significant change from R&D’s previous culture, which focused heavily on

face-to-face collaboration during product development. While remote work undoubtedly provided some benefits—notably, work-life balance enhancements for employees in the form of reduced commutes and more flexible schedules—it also posed challenges by introducing more asynchronous virtual communication, reducing hands-on time in the lab with new products, and demanding more energy from people leaders that were suddenly managing dispersed teams.

MSA executives are considering return-to-work plans on a department-specific basis; some functions like test engineering were never able to work remotely, while others like customer service are looking to work from home permanently. As the pandemic hopefully reaches an end in the U.S., the R&D leadership team needs to decide what the future of product development looks like at MSA—is it mostly in the office, mostly at home, highly flexible, or highly scheduled?

Methodology

This report describes a benefits, opportunities, cost, and risk (BOCR) decision-model framework that predicts what the "new normal" should look like for MSA's R&D workforce. The BOCR model structure is shown in Figure 1. Core model elements like strategic criteria and solution alternatives are evaluated upon below.

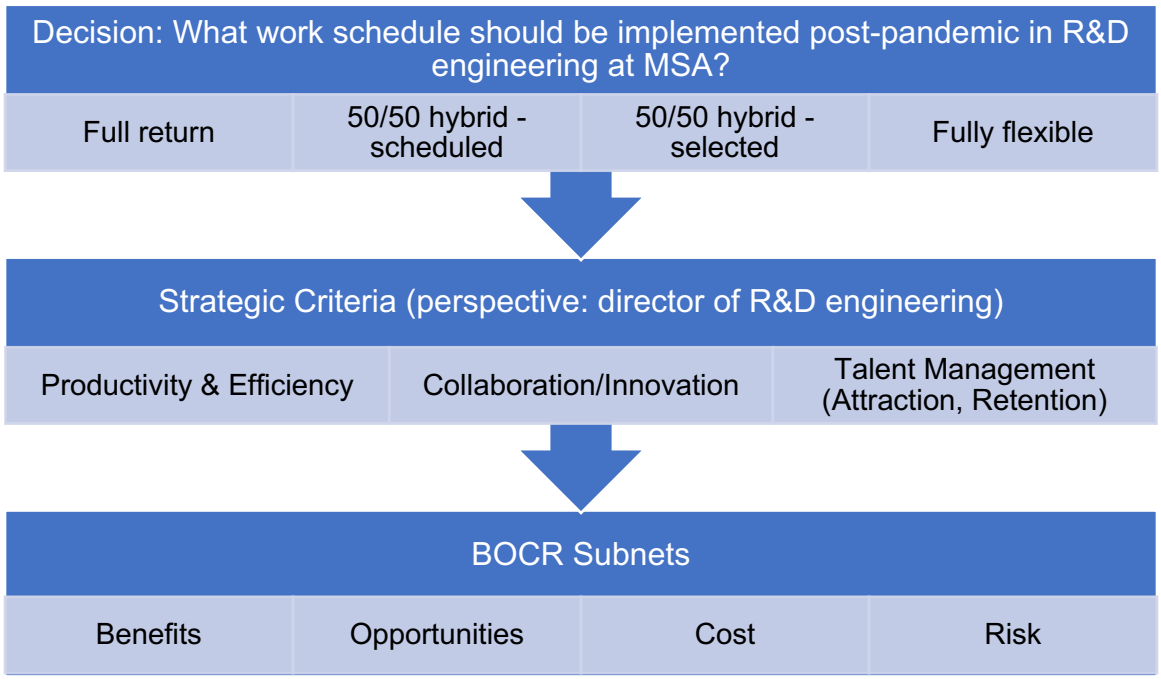

Figure 1: BOCR model structure.

Strategic Criteria

Strategic criteria for the decision were based on the perspective of the director of R&D engineering, who ultimately is responsible for recommending a permanent schedule or set of expectations for R&D associates. Criteria include:

- **Productivity and efficiency** – maximizing workforce efficiency increases speed-to-market for new MSA products, lowers R&D expense, and reduces engineering response time for critical product issues.

- **Collaboration and innovation** – because MSA employs a product leadership strategy, creating an R&D culture that is conducive to product innovation is a top priority for the decision-maker, and many studies have shown that effective collaboration is a key component to innovation [5].

- **Talent management (attraction and retention)** – R&D leadership not only wants to retain its employees, and especially its highest performers, as long as possible, but also relies on attracting a pipeline of top talent for long-term success.

Solution Alternatives

Four alternative options were proposed to be analyzed in the BOCR framework:

1. **Full Return.** This option reflects "going back in time" to the work schedule historically used in MSA engineering. The expectation would be for R&D associates to spend five days a week in the office to maximize face-to-face interaction. While MSA did offer flex work policies pre-pandemic including a 9/80 schedule (every other Friday off) and "work-from-home when needed", working remotely on a regular basis would not be an organizational norm under this schedule. This option offers the benefits of face-to-face interactions, direct manager supervision, and fairness as some R&D associates are not permitted to work from home due to the nature of their job responsibilities. It would also create opportunities for spontaneous collaboration. However, this option does have risks related to employee engagement, attraction, and retention as the flexibility of working-at-home has been perceived as a big benefit according to engagement surveys.

2. **50/50 Hybrid, Scheduled Days.** In this option, R&D associates that can complete some aspects of their role from home would work roughly 50% of the week in the office and 50% remote from home. A key aspect of this solution is that in-office days would be

scheduled—for example, every Tues/Wed/Thurs are in-office. Benefits of this option is a higher level of face-to-face interaction but at the cost of flexibility for employees. This option also has potentially higher costs as associates request periphery workstation items to enhance their productivity at home and in the office by having duplicate workstations. Risks include employee morale, hiring new talent, and the long-term enforceability and fairness of the policy as 'exceptions' are inevitably raised for consideration.

3. **50/50 Hybrid, Selected Days.** Unlike the previous option, R&D associates would be free to choose which days of the week they are in the office and at home as long as the 50/50 expectation is met. While this retains a higher level of flexibility for work-life balance and would still facilitate face-to-face interactions, not everyone will be in the office on the same day, requiring more planning, tracking, and coordination for collaboration opportunities. Similar costs and risks exist as the previous alternative.

4. **Fully Flexible.** This represents a status-quo or "do nothing" option. Today, R&D associates have the option to work from home when they choose to so long as project and lab obligations are fulfilled. While flexibility is high with this option, face-to-face collaboration has suffered in terms of both quality and quantity, although there is an opportunity for that to improve as face-mask mandates are lifted. Fully flexible schedules offer employee attraction opportunities and employee retention benefits, but also have the most risk concerning project efficiency, communication, and manager supervision.

BOCR Subnets and Control Criteria

The BOCR framework utilizes four sub-networks consisting of benefits, opportunities, costs, and risks. Each sub-network has a hierarchy of control criteria and sub-criteria that solution alternatives are evaluated against in an analytic network process (ANP). The construction of each sub-network is based on R&D leadership team knowledge and priorities gained by first-hand experience of the author. Sub-network structure is detailed in Table 1 below.

Table 1: BOCR subnets, control criteria, and sub-criteria.

Sub-network	Control Criteria	Cluster	Sub-Criteria	Connections
Benefits	Business-related	Communication	Face-to-face conversations	
			Face-to-face meetings	
			Email use	
		Lab access	Product testing speed	
			Product prototyping speed	
			Technician collaboration	

		Manager supervision	Frequency of interaction	Email management Face-to-face conversations Face-to-face meetings
			Schedule awareness	
			In-person 1:1 meetings	
		Talent pipeline	Retention	
			Onboarding	Face-to-face meetings Face-to-face conversations Frequency of manager interaction In-person 1:1s
			Hiring talent	
	Employee-related	Work-life balance	Commute	
			Schedule flexibility	
			Socialization	
		Job Performance	Onboarding	Manager face time Peer support
			Manager face time	
			Peer support	
		Work environment	Lack of interruption	
			Location flexibility	
			Privacy	
Opportunities	Business-related	Efficiency	Office space repurposing	
			Task-optimization	
			Digitalization	
		Talent management	Hiring advantage	
			Employee diversity	
			Employee engagement	
	Employee-related	Promotions	Networking	
			Professional development	Networking Supervisor coaching
			Supervisor coaching	
			Management visibility	
		Work-life balance	Work from anywhere	
			Flexible vacation plans	
			Flexible hours	
Costs	Infrastructure	IT	Workstations	
			IT security	
			Videoconferencing tech	
		Building	Space for 6-ft distancing	
			Utilities	
			Office supplies	
	Productivity	Efficiency	Communication speed	
			Product testing speed	
			Teamwork	
		Turnover	Manager burn-out	Employee attrition Training time
			Employee attrition	
			Training	
Risks	Business-related	Employee attrition	Loss of high performers	
			Employee morale	
			Attendance	
		Logistics	Department silos	
			EHS concerns	
		R&D	Collaborative culture	
			Innovation quality	Loss of high performers Attendance
			Project delays	

	Employee-related	Health and safety	Mental health	
			Health and safety concerns	
			Social isolation	

Data

The BOCR model was created using SuperDecisions software. The top-level network is shown in Figure 2. The decision or goal was linked to the three strategic criteria. A pairwise comparison for the relative importance of the strategic criteria was completed from the R&D director perspective. Because R&D is ultimately responsible for new product development and supporting MSA's product leadership strategy, collaboration and innovation was assigned the highest relative weight, with productivity (representing metrics such as speed to launch and R&D cost) and talent management (relates to long-term organizational health) assessed as slightly less important.

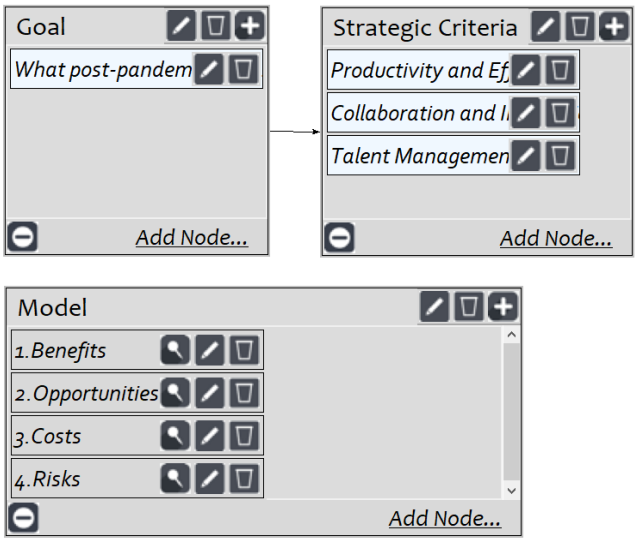

Figure 2: Top-level network.

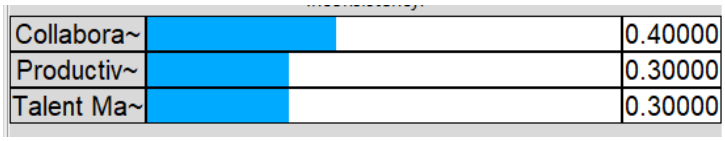

Figure 3: Strategic criteria pairwise comparison.

Each BOCR subnet was created & evaluated against solution alternatives using a 'bottom-up' approach before completing a ratings model with the strategic criteria.

Benefits Subnet

- **Most Beneficial Overall:** **A1 Full Return** **(0.31)**

- Most Beneficial, Business-related Criteria: A1 Full Return (0.41)
- Most Beneficial, Employee-related Criteria: A4 Fully Flexible (0.33)

Within the Benefits subnet, two control criteria were evaluated: benefits for the business and benefits for the employee. Within the Business-Benefits framework shown in Figure 4, top priorities for the alternatives cluster were A1 Full Return (0.41), followed by A2 50/50 Scheduled (0.24) and A3 50/50 Selected (0.23). This aligns with introductory research that many business leaders are pushing for a return-to-the-office to bolster face-to-face conversations with peers and direct supervisors.

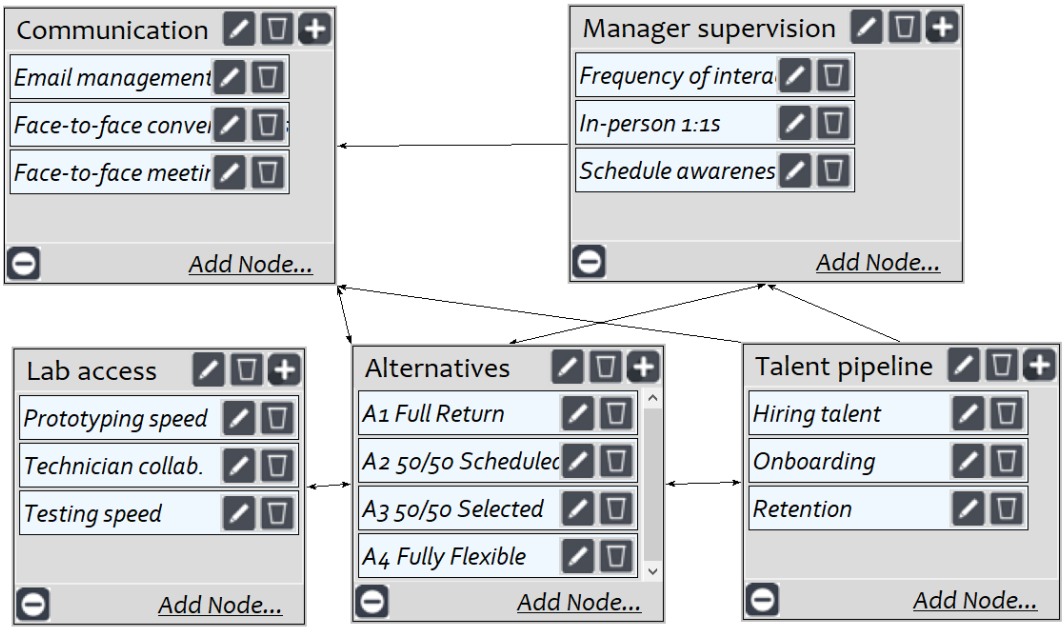

Figure 4: Benefits–Business Subnet.

Within the Employee-Benefits framework shown in Figure 5, top priorities for the alternatives cluster were A4 Fully Flexible (0.33) and A3 50/50 Selected (0.27). This also aligns with organizational behavior research that indicates that many corporate workers, including engineers, highly value benefits like schedule flexibility, a private work environment, and a reduced commute.

Since the decision-maker in this case is the director of engineering and not the employees themselves, business-related criteria were assigned a slighter higher weight in a pairwise comparison at 0.55. The 0.45 weight for employee-related criteria is still relatively high to reflect the importance of employee satisfaction and retention.

Priority values for overall benefits are shown in Figure 6. A1 Full Return is favored as the option offering the most benefits overall for R&D leadership. As revealed by this analysis, most of those benefits are business-related, and particularly concern communication efficiency, testing efficiency, and manager supervision and interaction.

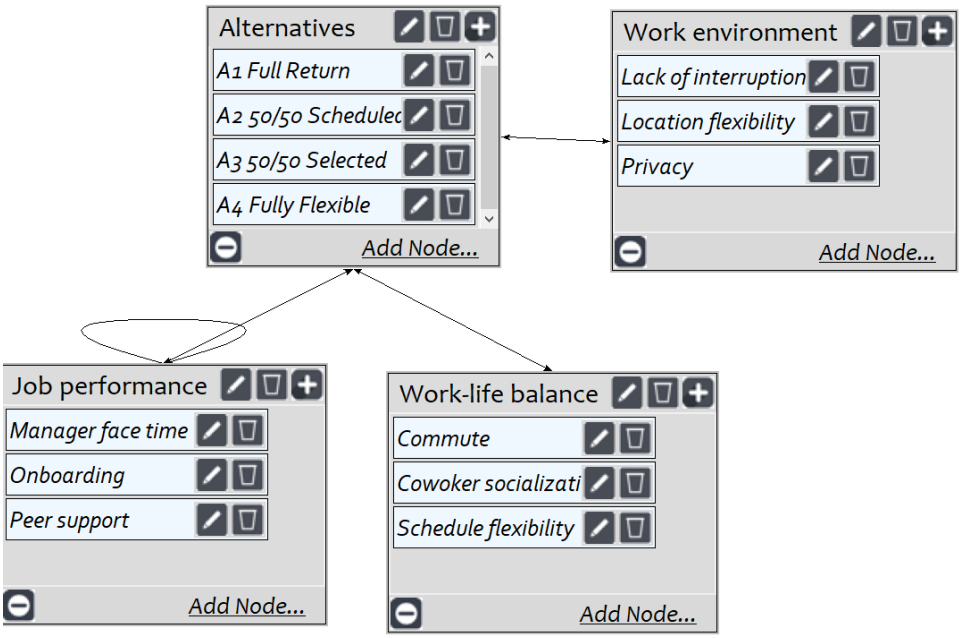

Figure 5: Benefits–Employee Subnet.

Name	Graphic	Ideals	Normals	Raw
A1 Full Return		1.000000	0.307802	0.831005
A2 50/50 Scheduled		0.697348	0.214645	0.579500
A3 50/50 Selected		0.801495	0.246702	0.666047
A4 Fully Flexible		0.749999	0.230851	0.623253

Figure 6: Benefits Subnet Overall Priorities.

Opportunities Subnet

- **Most Opportunity Overall:** **A4 Fully Flexible** **(0.36)**
- Most Opportunity, Business-related Criteria: A4 Fully Flexible (0.42)
- Most Opportunity, Employee-related Criteria: A4 Fully Flexible (0.30)

The Opportunities subnet also had two control criteria to capture opportunities related to the R&D organization itself (business) and for individual employees (employee). Within the Business-Opportunities framework shown in Figure 7, more flexible work schedules like A4 Fully Flexible

(0.42) and A3 50/50 Selected (0.31) were more favored. Although this may seem surprising given the results of the Business-Benefits network, it does makes sense upon closer analysis. Since employees highly value schedule flexibility and reduced commute, more flexible arrangements will create opportunity to make more competitive job offers, especially to candidates in areas outside of the Pittsburgh metro who may not be familiar with the company. Additionally, while more flexible schedules do hinder face-to-face interaction and collaboration as seen in the Benefits network, they offer opportunities to repurpose office space for storage or collaborative labs, force the digitalization of engineering records, and allow engineers to select the most appropriate work environment for a given task (collaborative lab for prototyping vs private desk at home for rigorous technical analysis).

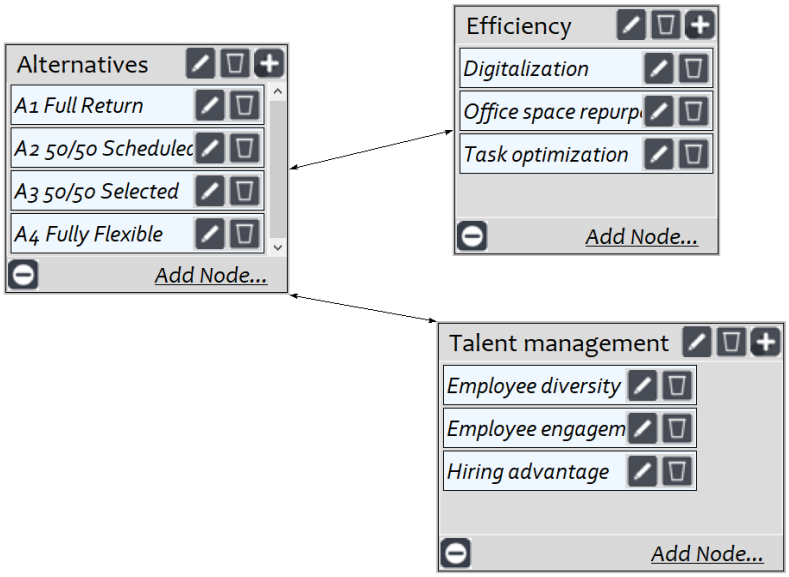

Figure 7: Opportunities-Business Subnet.

The Employee-Opportunities framework shown in Figure 8 favored A4 Fully Flexible (0.30) and A1 Full Return (0.26). As opposites of each other, these alternatives offer different opportunities to the employee. Fully flexible schedules give the employee opportunity to improve work-life balance even further by taking advantage of flexible hours, working from anywhere, and getting creative with vacation plans. Contrastingly, a full return to the office offers the employee the opportunity for faster promotion through management visibility, networking opportunities, and more frequent supervisor coaching. This is supported from a Stanford business study that found that remote workers were not rewarded with promotions at the same rate as in-office colleagues, even when performance was evaluated at the same level [6].

Similar to what was done for Benefits, business-related criteria were slightly favored with a weight of 0.55 vs employee-related criteria with a weight of 0.45 for opportunities. Overall priorities for opportunities are shown in Figure 9. Unsurprisingly, A4 Fully Flexible offers the most opportunity, with A1 Full Return offering the least.

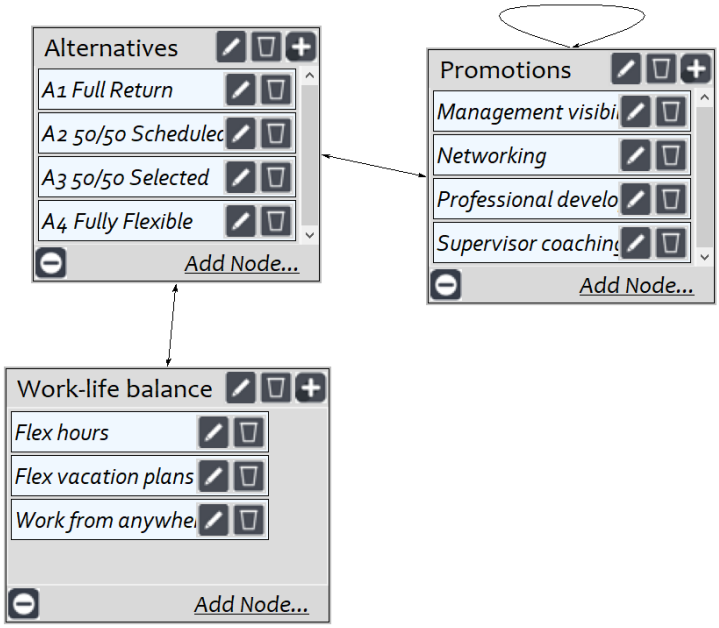

Figure 8: Opportunities-Employee Subnet.

Name	Graphic	Ideals	Normals	Raw
A1 Full Return		0.502944	0.179362	0.502944
A2 50/50 Scheduled		0.538570	0.192067	0.538570
A3 50/50 Selected		0.762566	0.271949	0.762566
A4 Fully Flexible		1.000000	0.356623	1.000000

Figure 9: Opportunities Subnet Overall Priorities.

Cost Subnet

- **Most Costly Overall:** **A4 Fully Flexible** **(0.41)**
- Most Costly, Infrastructure-related Criteria: A1 Full Return (0.31)
- Most Costly, Productivity-related Criteria: A4 Fully Flexible (0.41)

Within the Cost subnet, two control criteria were considered: infrastructure-related costs including information technology and building costs, and productivity-related costs. In the Infrastructure-Cost framework shown in Figure 10, A1 Full Return (0.31) represents the most costly option due to its relatively higher utilities cost, need for additional space and cubicles for social distancing, and high consumption of office supplies. For the Productivity-Cost framework shown in Figure 11,

A4 Fully Flexible (0.41) is expected to have high costs particularly regarding R&D manager burnout, employee training time, and efficiency-related items like communication, testing speed, and overall teamwork.

Since the decision-maker is the director of engineering and IT-related costs are centralized to MSA corporate, productivity costs were more heavily weighted for overall subnet computation (0.66 vs 0.33 weight). With this assessment, A4 Fully Flexible represents the most costly alternative at a priority of 0.34.

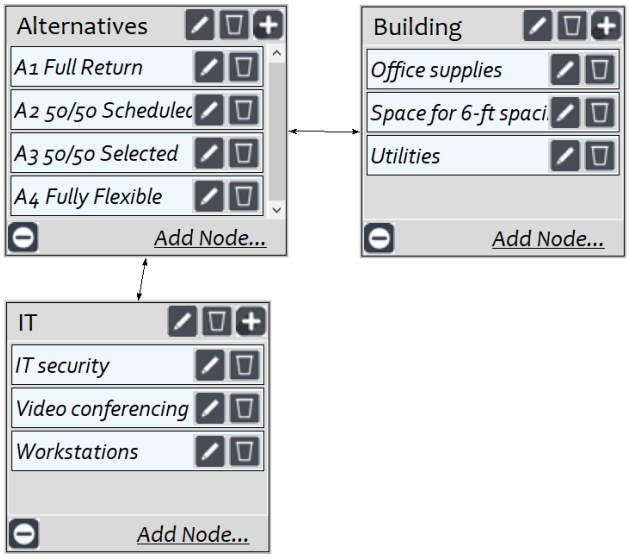

Figure 10: Cost-Infrastructure Subnet.

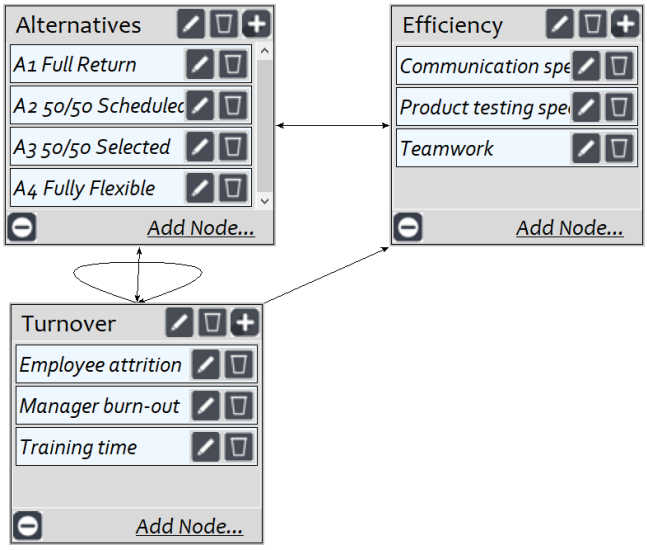

Figure 11: Cost-Productivity Subnet.

Name	Graphic	Ideals	Normals	Raw
A1 Full Return		0.727016	0.249496	0.667027
A2 50/50 Scheduled		0.549961	0.188735	0.504581
A3 50/50 Selected		0.636960	0.218591	0.584401
A4 Fully Flexible		1.000000	0.343178	0.917486

Figure 12: Cost Subnet Overall Priorities.

Risk Subnet

- **Most Risk Overall:** **A1 Full Return** **(0.41)**
- Most Risk, Business-related Criteria: A1 Full Return (0.39)
- Most Risk, Employee-related Criteria: A1 Full Return (0.43)

Lastly, within the Risk subnet, Business-related and Employee-related criteria were both evaluated. In the Business-Risk framework shown in Figure 13, risks related to R&D output, employee attrition, and logistics were compared to alternatives, and A1 Full Return (0.39) was favored as the highest risk option primarily due to its high employee attrition risks. A4 Fully Flexible had the next highest risk priority (0.28) related to increasing silos between departments and adversely affecting R&D performance.

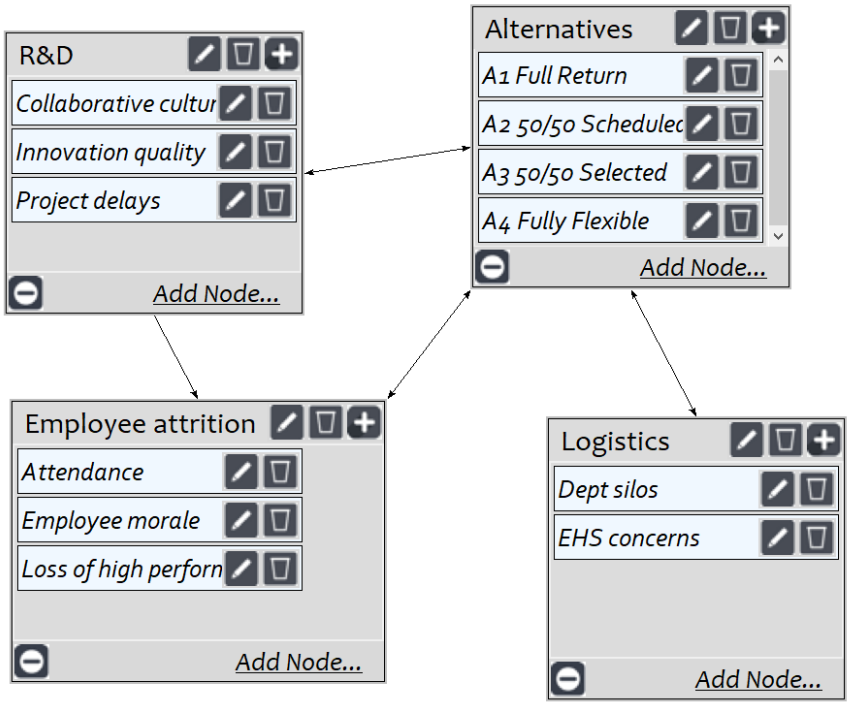

Figure 13: Risk-Business Subnet.

A small network was also created for Risk-Employee to evaluate the potential adverse effects on employee well-being for each alternate. A1 Full Return had the highest risk priority at 0.43. This

makes sense given its relatively higher risk of health & safety concerns and potential for adding stress to employee's lives by disrupting the work-life balance that they have adapted to over the last year and a half.

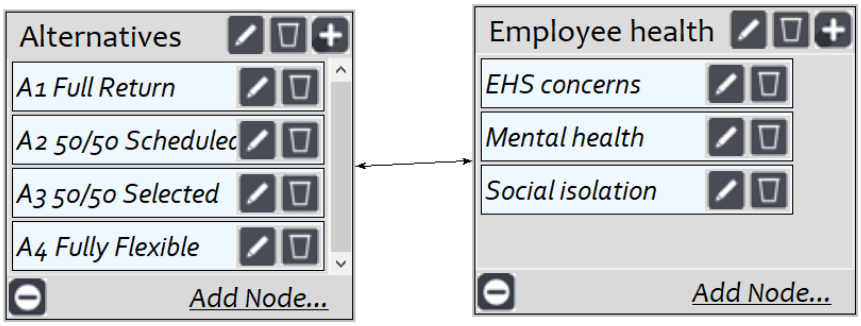

Figure 14: Risk-Employee Subnet.

Overall, A1 Full return had the highest subnet network priority as shown in Figure 15 below.

Name	Graphic	Ideals	Normals	Raw
A1 Full Return		1.000000	0.408584	1.000000
A2 50/50 Scheduled		0.393992	0.160979	0.393992
A3 50/50 Selected		0.359543	0.146903	0.359543
A4 Fully Flexible		0.693943	0.283534	0.693943

Figure 15: Risk Subnet Overall Priorities

In summary, the BOCR model identified the following alternatives as a reference for each category:

1. Benefits – A1 Full Return
2. Opportunities – A4 Fully Flexible
3. Cost – A4 Fully Flexible
4. Risk – A1 Full Return

Finally, the representative alternative for each category was compared to the strategic criteria using a four-point scale (Excellent, Good, Fair, and Poor) prior to full-model synthesis.

ScaleItem	Value	Graphic
Excellent	1.0000	
Good	0.5000	
Fair	0.2500	
Poor	0.1250	

Figure 16: Four-point scale for ratings model.

Alternatives	Priorities	Totals	Collaboration an... (0.4000)	Productivity and ... (0.3000)	Talent Manage... (0.3000)
1.Benefits	0.2582	0.5875	Excellent	Good	Poor
2.Opportunities	0.2418	0.5500	Fair	Good	Excellent
3.Cost	0.2418	0.5500	Fair	Good	Excellent
4.Risk	0.2582	0.5875	Excellent	Good	Poor

Figure 17: Ratings table prior to full-model synthesis.

Analysis

The analysis was run using both the multiplicative and additive-negative formulas for comparison. Results can be seen in Figures 18 and 19 respectively.

In the multiplicative approach, which represents the marginal benefit/marginal cost for each option (BO/CR), **A3 50/50 with Selected In-Office Days** is the most preferred solution with a normal value of 0.43.

Name	Graphic	Ideals	Normals	Raw
A1 Full Return		0.259215	0.112037	0.626585
A2 50/50 Scheduled		0.649466	0.280711	1.569916
A3 50/50 Selected		1.000000	0.432218	2.417243
A4 Fully Flexible		0.404968	0.175034	0.978906

Figure 18: BOCR Full-model synthesis with multiplicative approach.

Alternatively, in the additive-negative approach, which represents the sum of benefits and costs (bB+oO-cC-rR),**A4 Fully Flexible** is the most preferred solution with a normal value of 0.30.

Name	Graphic	Ideals	Normals	Raw
A1 Full Return		0.834825	0.244483	0.672382
A2 50/50 Scheduled		0.694932	0.203514	0.559709
A3 50/50 Selected		0.884903	0.259148	0.712715
A4 Fully Flexible		1.000000	0.292855	0.805416

Figure 19: BOCR Full-model synthesis with additive-negative approach.

These results lend themselves to an interesting discussion for R&D leadership. In the short-term, a hybrid schedule that mandates 50% attendance but with the flexibility to select what days is by far the superior option. An examination of its BOCR attributes shows why: it has a high probability of retaining current employees, while regaining some of the collaborative face-to-face and direct manager supervisor that mitigates the risk of not meeting R&D output goals. (This is also currently the option being discussed by MSA leadership for implementation.)

However, in the long-term, a fully flexible schedule offers opportunities to become more efficient, attract higher talent employees, and potentially increase R&D performance. However, in reality, for a fully flexible schedule to be successfully implemented, both managers and employees would

need to establish a high degree of trust, a commitment to maintaining working relationships, and personal accountability for keeping testing moving and meeting R&D output goals.

Sensitivity

A sensitivity analysis was conducted based on the relative priorities of the lower-level subnets. This was done with the additive-negative model to simulate sensitivity for the long-term proposal. For the benefits subnet, A1 Full Return becomes the best overall result when benefits are weighted above 45%. This makes sense; from a business-benefit perspective, a full return was heavily favored as previously discussed, and business-related benefits are more important than employee-benefits to the director of engineering as the decision-maker. If these benefits are prioritized and the risk of employee attrition and hiring opportunities are accordingly de-prioritized, a full-return becomes more and more attractive versus a more flexible schedule.

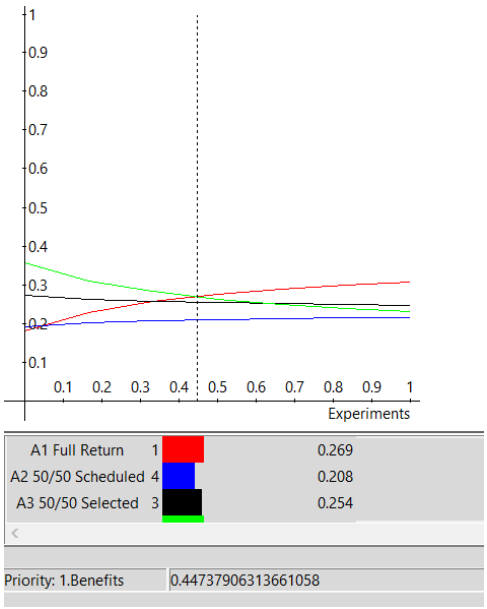

Figure 20: Sensitivity analysis, Benefits subnet weighting.

For the opportunities subnet, there is some instability around 13.5% weighting. If opportunities are weighted below 13.5%, A1 Full Return is the most desirable solution; if weighted above, A4 Fully Flexible remains the recommended approach. Although this could reflect some small inconsistencies in the ratings, it does make some logical sense – the fully flexible schedule is recommended because of the opportunity, and specifically long-term efficiency and talent management opportunities, that it presents, and if these are deprioritized the option becomes less attractive.

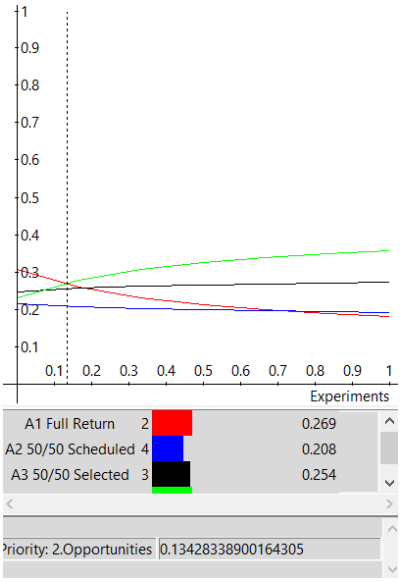

Figure 21: Sensitivity analysis, Opportunities subnet weighting.

For the cost subnet, some interesting results can be observed in the sensitivity analysis. When costs are ignored or considered less important (<~10%), the fully flexible solution is the best option despite its higher productivity-related costs. Between 10% and 50% weighting, A3 50/50 hybrid with selected days has the highest priority as it represents a balance between retaining employees, managing productivity, and slightly saving on infrastructure costs versus a full return. Above 50% weighting, A2 50/50 scheduled becomes the most preferred solution; this is a suspicious result and reflects some potential inconsistency in this subnet.

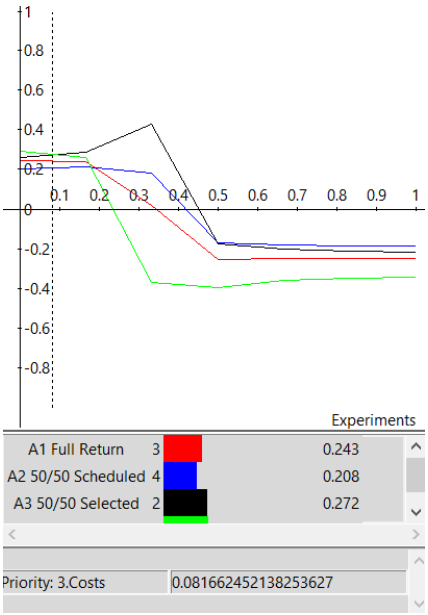

Figure 22: Sensitivity analysis, Cost subnet weighting.

Finally, for the risk subnet, A2 50/50 hybrid with self-selected days manages risk the best for most of the weighting range with the exception of very low or very high weights were some instability can be observed.

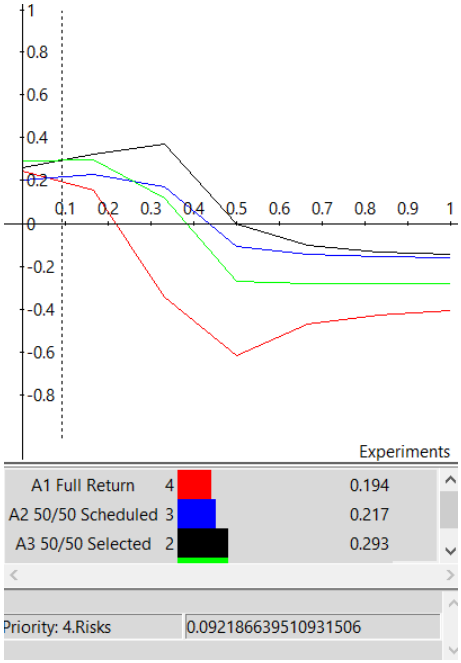

Figure 23: Sensitivity analysis, Risk subnet weighting.

Conclusion

This model predicts that while a 50/50 hybrid schedule will be tempting to put in place as COVID-related restrictions are lifted in order to regain collaboration and face-to-face professional development, retaining a fully-flexible schedule may offer the most long-term benefit for the company in the form of employee engagement, retention, competitive hiring, and optimizing work environments for a given task.

While a full return to work would offer substantial business benefits, high levels of cost and risk in the form of employee attrition make in an inviable option. This is consistent with both internal company surveys and external research; after a yearlong work-from-home “experiment,” employees have become accustomed to and expect some degree of flexibility from their employer of choice.

A 50/50 hybrid schedule with mandated days manages R&D performance and employee attrition risks somewhat, but the lack of additional flexibility and reduced attendance make it less promising in terms of benefit and opportunity than either a full return or a 50/50 hybrid with selected days.

Although this model attempts to capture the benefits, opportunity, cost, and risk at a high level for different work arrangements, it's important to remember that ultimate success of any alternative work schedule highly depends upon establishing a strong organizational culture, hiring motivated and passionate employees, building manager/employee trust, and setting clear performance expectations [7].

References

[1] *Change in Remote Work Trends after COVID in USA*. Statista, Apr. 2020, www-statista-com.pitt.idm.oclc.org/statistics/1122987/change-in-remote-work-trends-after-covid-in-usa/.

[2] Parker, Kim, et al. "How Coronavirus Has Changed the Way Americans Work." *Pew Research Center's Social & Demographic Trends Project*, Pew Research Center, 25 May 2021, www.pewresearch.org/social-trends/2020/12/09/how-the-coronavirus-outbreak-has-and-hasnt-changed-the-way-americans-work/?=1.

[3] "CDC COVID Data Tracker." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, covid.cdc.gov/covid-data-tracker/#trends_dailytrendscases.

[4] Jdickler. "Tensions Rise as Return-to-Work Plans Gain Steam." CNBC, CNBC, 27 Apr. 2021, www.cnbc.com/2021/04/27/tensions-rise-as-return-to-work-plans-gain-steam.html.

[5] "3 Ways to Build a Culture of Collaborative Innovation." Harvard Business Review, 12 Aug. 2019, hbr.org/2019/08/3-ways-to-build-a-culture-of-collaborative-innovation.

[6] "Why in-Person Workers May Be More Likely to Get Promoted." BBC Worklife, BBC, www.bbc.com/worklife/article/20210305-why-in-person-workers-may-be-more-likely-to-get-promoted.

[7] Windley, David. "Council Post: How To Create A Successful Flexible Work Culture." Forbes, Forbes Magazine, 26 June 2020, www.forbes.com/sites/forbeshumanresourcescouncil/2020/06/29/how-to-create-a-successful-flexible-work-culture/?sh=1a6a496d14be.