Attachment L:
Framing a Cost Benefit Analyses (CBA)

Define the following:	Description
Step 1: The problem	The objective of the study is to examine how the costs of the TS and E interventions compare with the benefits.
Step 2: Control options	TS and E interventions versus no control
Step 3: Audience	TEMA and employees, other manufacturers
Step 4: Perspective	TEMA
Step 5: Time frame and Analytic horizon	Two years from implementation of TS and E interventions *(e.g. short enough that the outcomes are not unacceptably uncertain, but not long enough to capture fully the costs and benefits that are attributable to the program, and to account for seasonal variations in program activity levels and targeted health outcomes),*
Step 6: Discount rate	6% *(to compare benefits and costs that occur at different times by adjusting their values according to the time preference corresponding to the chosen perspective)*
Step 7: Format	Key data was derived by a prospective experimental design (in Phase)

Benefits	Costs
Direct costs averted • Averted workers' compensation costs (both medical and indemnity)[1] **Indirect costs averted** • Reduced or averted costs of absenteeism[2] • Reduced or averted costs of presenteeism[2] • Reduced turnover costs[3] **Value Added** • Improved product quality[2] • Improved task efficiency[2]	**Direct costs** *Tool Support (TS)* • New/ replacement equipment [2] • Equipment installation[2] • Equipment maintenance[2] *Exercise Program (E)* • Personnel time (to attend and conduct training) [2] • Training materials[2] **Indirect (productivity losses)** • Productivity losses to company attributable to program[2] • Productivity losses to employees attributable to program[2]
Intangible benefits[3] Averted pain and suffering from back injury	**Intangible costs**[3] Stress on employees caused by program
[1]Estimated using Toyota historical data (e.g. frequency/ costs for shoulder related MSDs associated with overhead work in processes similar to those targeted during Phase B) [2]Estimated using data collected during Phase B [3]Not estimated for this study	

The formula for *NPV, where: r = discount rate (interest rate), t = year, and n = analytic horizon (in years)* is:

$$NPV = \sum_{t=0}^{n} \frac{(\text{Benefits - Costs})_t}{(1+r)^t}$$

The formulas for ROI are presented below:

$$ROI = \frac{PV_{benefits} - PV_{costs}}{PV_{costs}}$$, or

$$ROI = \left[\frac{PV_{benefits}}{PV_{costs}} \right] - 1$$