

SHORT INTERVAL CONTROL (SIC)

UNDERGROUND MINING WORKING GROUP

This guideline will be a roadmap outlining possible paths from an “analog” mine to short interval control, a development necessary for creating best practices in shift time and use of assets in underground mines. Implementing this guideline will allow for better planning, quicker decisions, increased production and lower costs.

Short Interval Control (SIC) is a form of control and response, a structured process for identifying and acting on opportunities to improve effectiveness and efficiency of mining processes (production, development and services). The intended outcome is a continuous improvement loop of increased productivity and minimized waste. More broadly, SIC enables an effective plan, do, check, act (PDCA) loop for mining processes. The PDCA concept is well-accepted in manufacturing as a continuous improvement loop that involves assessing a process and determining how to improve it (plan), testing the plan (do), evaluating the process tested (check) and then fully implementing the process (act).

Successful SIC involves the following four functions:

1. Planning (strategic and tactical)
2. Situation Awareness
3. Resource Management
4. Operational Decision Making

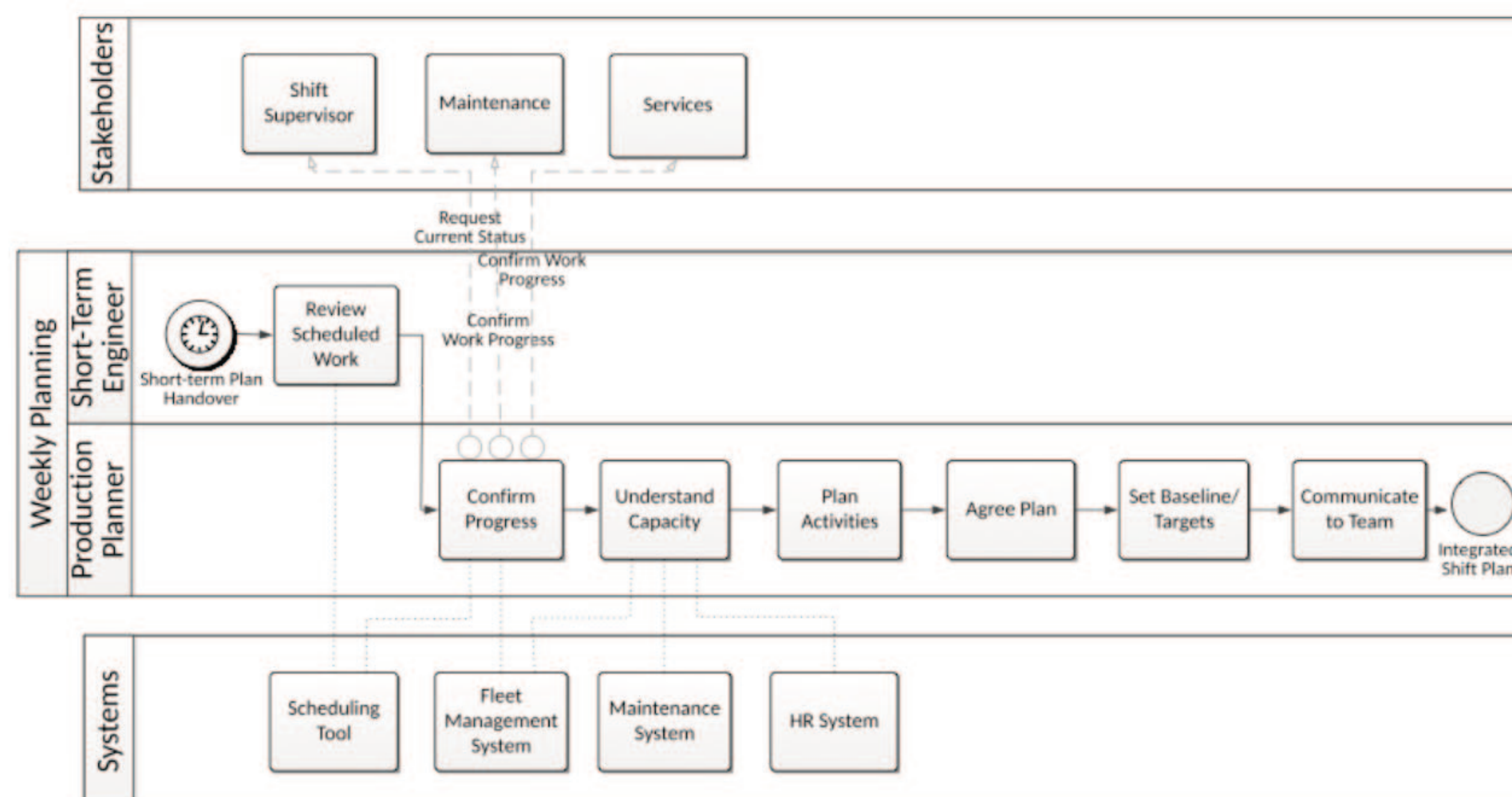
Many industry leaders that implemented the concept have seen significant productivity and cost improvements, at a limited expense. The guideline will deliver much-needed independent guidance and direction on the available options for SIC, allowing for greater and faster adoption of control technologies. Enabling the SIC adoption will give the mining industry the required processes to optimize shift time and asset use (personnel, equipment and headings/stopes) in underground mines. This will allow for better planning, quicker decisions, increased production and lower costs.

The guideline is meant to provide somewhere to start. Rather than replace consultants or suppliers, it is a roadmap meant to increase the speed and likelihood of success for SIC implementations, while avoiding common pitfalls. It also aims to present options and best practices for introducing SIC processes and technologies. The guideline offers a descriptive guiding framework of what SIC may look like in a mine and designates different levels of maturity, which are summarized (see below).

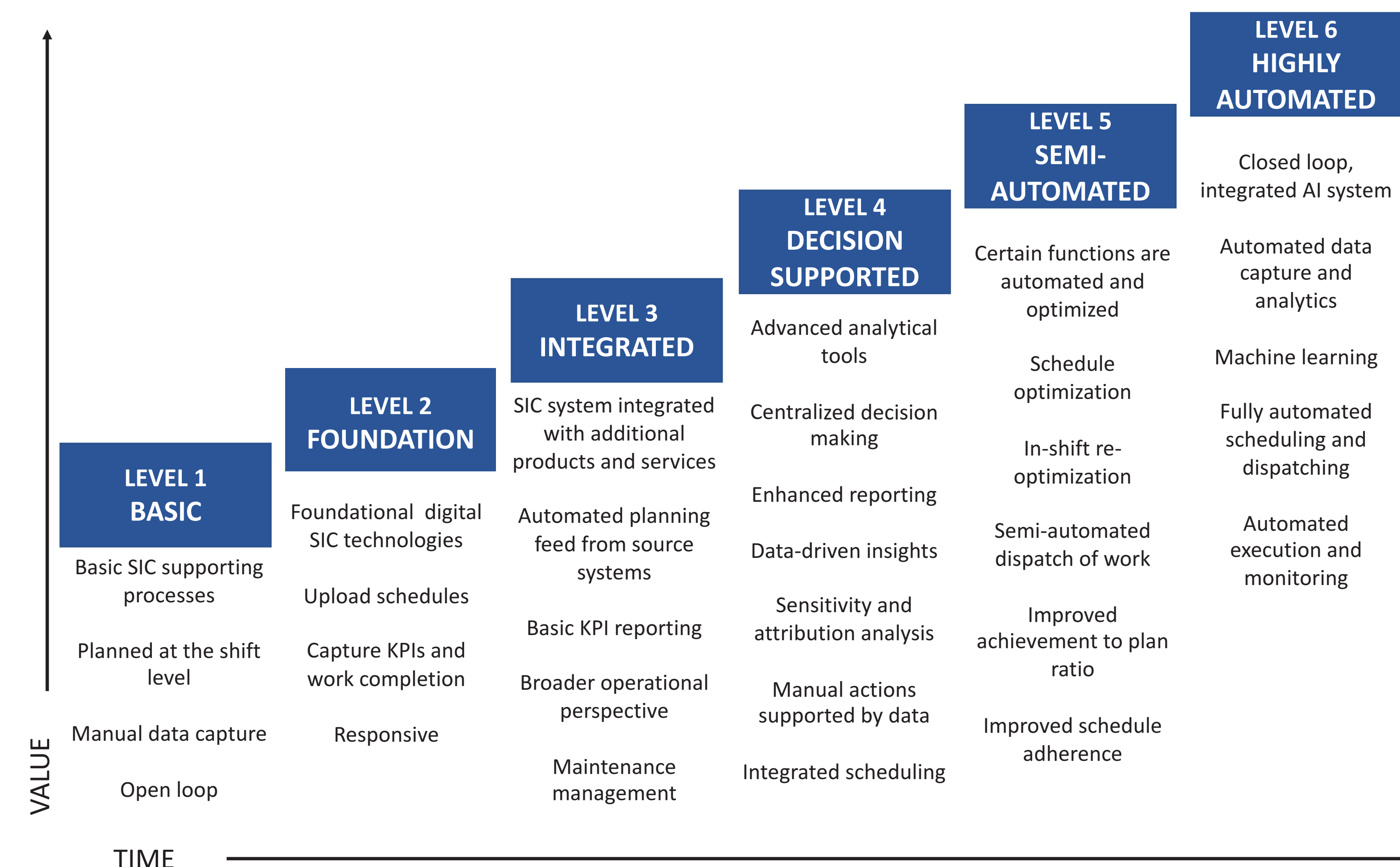
Also covered in this guideline...

- **VALUE PROPOSITION**
 - Overall Equipment Effectiveness
 - Operational Processes
 - Benefits to Supervisors
 - Safety and Emergency Procedures
 - Maturity Levels and Benefits
- **OPERATIONAL MODEL**
 - Conceptual Operations
 - Developing the Operational Framework
 - Current State ('As-Is')
 - Future State ('To-Be')
 - Short Interval Control Activities Summary
 - Processes
 - Business Context
 - Weekly Plan Preparation
 - Shift Scheduling
 - In-Shift Review
 - Post-Shift Review
 - Data Enablement
 - Level 1: Basic
 - Level 2: Foundation
 - Level 3: Integrated
 - Level 4: Decision Supported
 - Level 5: Semi-Automated
 - Level 6: Highly-Automated
 - Recommended Contextual Reading
- **IMPLEMENTATION**
 - Culture
 - Planning
 - Change Management Plan
 - Scope of Work
 - Project Roadmap
 - Deployment

WEEKLY PLANNING PROCESS DIAGRAM



SIC MATURITY MODEL



PARTICIPATING COMPANIES

ABB, ACCENTURE, ACORN, ALEX ATKINS & ASSOCIATES, ALPHA TECHNOLOGIES, APEX AUTOMATION, AVEVA, BARRICK GOLD, BHP, BOLIDEN, BUSINESS SWEDEN, CAMBORNE SCHOOL OF MINES, CAMIRO, CENTRIC MINING SYSTEMS, COMMIT WORKS, CORFO, DASSAULT SYSTÈMES, DATAMINE, DELOITTE, DESWIK, ECM NETWORKS, EPIROC, ERICSSON, FLOW PARTNERS, FLUIDMESH NETWORKS, FREEPORT-MCMORAN, GLENCORE, GLOBAL IO, GOLD FIELDS, GRIPTION, HATCH, HEXAGON MINING, HINDALCO, IBM, JVA, KOMATSU, KPMG, LAC DES ILES MINE, LUNDIN MINING, MACLEAN ENGINEERING, MAESTRO DIGITAL MINE, MICROMINE, MINERP, MINETEC, MOBILARIS, MST GLOBAL, NEWMONT, NEWTRAX, NORTH AMERICAN PALLADIUM (NAP), NORTHERN LIGHT TECHNOLOGIES, NORTHERN STAR RESOURCES, ORBCOMM, PA SPATIAL, PRONTOFORMS, PROUDFOOT CONSULTING, PT UKU TECH INDONESIA, QUARTZ, ROCKWELL AUTOMATION, RPM GLOBAL, SANDVIK, SCANIA, SDMT, SIEMENS, SITECH, SKF, SYMBIOTIC INNOVATIONS, TECHNICAL UNIVERSITY OF MADRID, TECK, TERRATIVE DIGITAL SOLUTIONS, THIESS, TITAN MINING CORP, UNIVERSITY OF QUEENSLAND, VALE, VOLVO, WEST ARM CONSULTING GROUP, WIPRO CONSULTING, YOURPACE