

**SKILLS FRAMEWORK FOR PRECISION ENGINEERING  
TECHNICAL SKILLS AND COMPETENCIES (TSC) REFERENCE DOCUMENT**

<b>TSC Category</b>	Big Data Analytics					
<b>TSC</b>	Data Synthesis					
<b>TSC Description</b>	Analyse factory automation and manufacturing data to monitor the manufacturing processes for operations and product or process flow optimisation					
<b>TSC Proficiency Description</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Level 4</b>	<b>Level 5</b>	<b>Level 6</b>
			<b>PRE-DAT-3006-1.1</b>	<b>PRE-DAT-4006-1.1</b>	<b>PRE-DAT-5006-1.1</b>	<b>PRE-DAT-6006-1.1</b>
			Analyse productivity and quality indices (system index) using system algorithms to manage and sustain a unit process or process flows	Review in-flows and out-flows of materials in manufacturing to maximise productivity and reduce cycle time	Define new control charts and analyse day-to-day operations that may disrupt the automation systems stability with respect to storage conditions and delivery times	Synergise data mining techniques like multiple regressions, data clustering, neural networks to develop models for process or equipment performance data analysis
<b>Knowledge</b>			<ul style="list-style-type: none"> <li>Manufacturing execution systems (MES)</li> <li>Bill of materials (BOM)</li> <li>User interface of manufacturing tools and/or devices</li> <li>Quality management systems</li> <li>Data mining and production modelling</li> </ul>	<ul style="list-style-type: none"> <li>Bill of materials (BOM)</li> <li>Materials flow</li> <li>Process control plans</li> <li>Capacity planning</li> <li>Constraints management</li> </ul>	<ul style="list-style-type: none"> <li>Manufacturing process</li> <li>Manufacturing execution systems (MES)</li> <li>Materials flow control</li> <li>system configuration setups</li> <li>Software simulations</li> <li>Quality management systems</li> </ul>	<ul style="list-style-type: none"> <li>Concept of data cube</li> <li>Types of data clustering and their features</li> <li>Steps of K-means clustering</li> <li>Statistical concepts of mean, variances, standard deviations and correlation</li> <li>Concept of model coefficient and residual errors</li> <li>Total sum of squares (SST), sum of squares due to regression (SSR), sum of squares due to error (SSE), T-test, confidence interval and other terms used in statistical data analysis</li> <li>Guidelines to evaluate the time series forecasting model</li> <li>Difference between regression and autoregressive–moving-average (ARMA) models</li> <li>Structure of back-propagation (BP) neural</li> </ul>

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						<p>networks and advantages of neural networks</p> <ul style="list-style-type: none"> <li>• Data normalisation</li> </ul>
<b>Abilities</b>			<ul style="list-style-type: none"> <li>• Apply 'plan-do-check-act' (PDCA) approach for production modelling</li> <li>• Manage the entire process flow to meet the organisation's safe, right and fast requirements</li> <li>• Manage line production in real-time through remote, or offline, access</li> <li>• Set indicators for look-ahead maintenance of process tools to minimise unplanned downtimes</li> <li>• Provide accurate forecasts in production and lot traceability for speedy lot recalls</li> <li>• Monitor and control materials handling and consumables consumption</li> </ul>	<ul style="list-style-type: none"> <li>• Develop manufacturing activities system interfaces</li> <li>• Establish equipment utilisation monitoring systems</li> <li>• Develop material despatch systems, based on material inflow and outflow</li> <li>• Update line constraints, timely to planning systems, using big data</li> <li>• Improve accuracy of material despatch systems to meet quality, yield and delivery, based on big data analysis</li> </ul>	<ul style="list-style-type: none"> <li>• Perform destination and alternate storage (automation)</li> <li>• Analyse operations and product flow for optimisation</li> <li>• Define new control charts to establish processes for continuous improvements</li> <li>• Perform data mining and/or analysis</li> </ul>	<ul style="list-style-type: none"> <li>• Design data cubes and data schema</li> <li>• Apply hierarchical clustering technique for quality control</li> <li>• Apply K-means clustering technique for quality control</li> <li>• Measure correlation and dependency between process variables</li> <li>• Build linear regression model</li> <li>• Evaluate regression model accuracy and model coefficient significance</li> <li>• Build autoregressive–moving-average (ARMA) model</li> <li>• Develop regression mode and ARMA model for equipment automould processes</li> <li>• Develop a neural network for predicting process yield</li> </ul>