TSC Category	Big Data					
TSC	Data Synthesis					
TSC Description	Analyse factory automation and manufacturing data to monitor the manufacturing processes for operations and product or process flow optimisation					
TSC Proficiency Description	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**	**Level 6**
			FMF-DAT-3006-1.1	**FMF-DAT-4006-1.1**	**FMF-DAT-5006-1.1**	**FMF-DAT-6006-1.1**
			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
Knowledge			• Manufacturing execution systems (MES) • Bill of materials (BOM) • User interface of Manufacturing Tools and/or Devices • Quality Management Systems • Data Mining and Production Modelling	• Bill of materials (BOM) • Materials flow • Process Control Plans • Capacity planning • Constraints management	• Manufacturing process • Manufacturing execution systems (MES) • Materials Flow Control System configuration set-ups • Software simulations • Quality Management Systems	• Concept of data cube • Types of data clustering and their features • Steps of K-means clustering Basic terms such as mean, variances, standard divisions and correlation • Concept of model co-efficient and residual errors • Basic terms such as “total sum of squares “(SST), “sum of squares due to regression” (SSR), “sum of squares due to error” (SSE), T-test, confidence interval • Guidelines to evaluate the time series forecasting model • Difference between regression and autoregressive–moving-average (ARMA) models • Structure and advantages of neural networks • Data normalisation

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Abilities			• Apply "plan, do check, act" (PDCA) approach for production modelling • Manage the entire process flow to meet the organisation's requirements • Manage line production in real-time through remote or offline access • Set indicators for look-ahead maintenance of process tool to minimise unplanned downtime • Provide accurate forecasts in production and lot traceability for speedy lot recalls • Monitor and control materials handling and consumables consumption	• Develop manufacturing activities system interface • Establish equipment utilisation monitoring system • Develop material despatch system based on material in-flow and out-flow • Update line constraints timely to planning system using big data • Improve accuracy of material despatch system to meet the highest quality, yield and delivery based on big data analysis	• Perform destination and alternate storage (automation) • Analyse operations and product flow for optimisation • Define new control charts to establish process for continuous improvement • Perform data mining and/or analysis	• Design a data cube and a data schema • Apply hierarchical clustering technique for quality control • Apply K-means clustering technique for quality control • Measure correlation and dependency between process variables • Build linear regression model • Evaluate regression model accuracy and model coefficient significance • Build autoregressive–moving-average (ARMA) models • Develop regression mode and ARMA model for equipment auto-mould process • Develop a neural network for predicting process yield