



MOM Solution Guide 2020 MES

The independent guide to evaluate, assess and
consider the potential of your MOM solution!

SUMMARY

MOMi's business consultant team have tracked the latest trends in Manufacturing Operations Management (MOM), particularly looking at Manufacturing Execution Systems (MES).

As part of our MOM Solution Guide, 43 MES suppliers from around the world have shared the details of services, technologies, quality and focuses of their MES solutions. The Solution Guide aims to provide our clients and business partners with clear solution overviews and insights into market developments.

Despite mergers, acquisitions and possibly bankruptcies, there are still many technologies and solutions to choose from. This offers MES buyers a greater opportunity to find the perfect solution but also increases the challenge of finding it.

Business challenges

For manufacturing companies, the pressure to perform has been, is and always will be tremendous. Especially now, in a period with COVID-19, manufacturers need to use all of their resources – equipment, materials and people – to the max for achieving efficiency and effectiveness, while being compliant to applicable regulations. Right now, agility has become even more important than it already was in the past years.

In the past, MES was typically in the domain of technical automation, connecting to equipment and automation systems to collect data from the manufacturing process. Then IT managers used MES solution as a 'tool' to improve business processes. Nowadays, manufacturing business managers perceive MES as a contributor to achieve their strategic goals. It has become clear that not only the technology creates their success. Technology should be part of a balanced approach together with standardized manufacturing operations processes, an adequate organization and governance – with clear roles and responsibilities - and well-skilled people. By continuously improving, the manufacturing performance will grow towards the excellence level.

Smart Manufacturing and Industry 4.0

Introduced about six years ago, Smart Manufacturing and Industry 4.0 have been discussed extensively to find out how these new technologies and methodologies can help in a practical way. One thing is clear, that manufacturers need to be ready to be able to leverage the benefits of them. As is true for any industrial revolution in the past, also the fourth one builds its success on top of a solid foundation from the previous revolution. In this case, that solid foundation is formed by well deployed and used Manufacturing Operation Management (MOM) solutions. As said, this is not just about the solutions or technology! Industry 4.0 is not about the rise of the machines but about empowering people.

MES Solutions

There is a large variety between the MES solutions with respect to the functionalities they offer. Each solution has its own characteristics, industry sector focus, degree of freedom in configuration and customizing.

The most 'popular' industry sectors are Food & Beverages, Automotive, Medical Devices and Consumer Packed Goods. Least indicated as focus sector are Oil & Gas, Utilities & Public Sector and Mining.

Production Operations Management activities are better supported by out-of-the-box and configurable functionality than Maintenance, Quality Test and Inventory Operations.

The technical platform options as operating systems, databases, development tools, are converging with the Microsoft platform still being dominant. Many solutions (81%) can run in a browser on any device because of the use of HTML5.

MES solutions offer a lot in terms of smart functionality for Industry 4.0, but further innovations are expected.

Other aspects

Around 60% of the MES vendors have a Quality Assurance (QA) system in place for the development of their solution of which ISO 9001 is applied most. This means that nearly 40% of the vendors do not have a QA system (yet).

In general, vendors are sharing their deployment experience with their customers in order to reduce cost, throughput time and risks of the deployment. The vendors referred to template based approach, cloud and web and configurability and scalability as strong point for multi-site roll-out.

Expectations for MES for the next years are quite high. The increase of the MES market is expected to be significant. Various analysts mention growth rates between 9% and 14% (CAGR from 2020 – 2025) dependent on the region and industry sector.

This MOM Solution Guide - MES provides extensive information, primarily to manufacturers, to help them with their selection of an appropriate MOM solution to improve their performance, now and into the future.

Request to the readers

In order to improve our annual MOM Solution Guide - MES, we are very interested to hear your views. If you have suggestions for additional topics or questions to the vendors, please, submit them to us.

October 29, 2020

Gerard Ipskamp, Mathijs Philips and Jan Snoeij

Manufacturers / producers

This report contains information for getting a first impression of the available products and their possible use. It will help potential consumers of MES to boil down the extensive offer of global MES vendors to a list of 5 to 10 vendors worth a closer look. Criteria to be used could be the market focus and experience of the solution provider, or the supported production or manufacturing operations, or the compliance of the MES products to the ISA95 activity models. It reduces the cost for composing a shortlist and provides a framework for asking the right (local) solution providers for a first evaluation of their product. This Guide is meant as long-list to hand over to future users as an orientation on the broad world of MES or as an aid on the first steps towards a selection of a sufficiently good MES solution.

Solution Providers

For the solution providers this report provides a feedback to their strategy and focus. Since the content of the questionnaire is based upon end users' reactions too, it gives an impression of the trends in the market.

MOMi

For MOMi this Guide delivers valuable information for providing better advice to our customers. During many years, our experts gathered information about a large number of MES solutions and we used this information in many consultancy projects helping the customer to determine which product could be helping them best in achieving operations excellence. Through the questionnaire for this Guide and direct communication, we received updated input from the solution providers themselves.

All

We hope that the survey and the results thereof in this Guide will contribute to many successful implementations of MES. If you have any questions about this Guide or suggestions for next years' edition, please let us know.

1.3 Participants

In the table below all 43 vendors and their MES solutions in this MOM Solution Guide are listed in alphabetical order of the product. Some participating vendors did not answer all questions, because they consider some information, e.g. financial data, markets share and projects realized, as confidential. The topics in this Guide are reflecting all vendors or MES solutions unless otherwise indicated.

No.	Vendor	MES Solution	Country
1	Olsom	AGW MES	Poland
2	Applied Materials	Applied SmartFactory	USA
3	Astrée Software	AquiWEB	France
4	Arcstone	arc.ops	Singapore
5	ATS Global	ATS ADOS	The Netherlands
6	AVEVA	AVEVA OES	United Kingdom
7	CAT Squared	CAT Squared MES	USA
8	Leading2Lean	CloudDISPATCH LES	USA
9	ORDINAL	COOX / MESbox	France
10	İletişim	CoralReef MES	Turkey
11	Critical Manufacturing	Critical Manufacturing MES	Portugal
12	Delfoi	Delfoi Planner	Finland
13	Dassault Systèmes	DELMIA Apriso	France

No.	Vendor	MES Solution	Country
14	DELMIAworks, a subsidiary of Dassault Systèmes	DELMIAWorks	USA
15	CSM Systems	DIAMES	Switzerland
16	edinn global	edinn M2	Spain
17	MPDV	HYDRA	Germany
18	iBASEt	iBASEt MES	USA
19	InTouch Systems	IcSoft MES	India
20	camLine	InFrame Synapse	Germany
21	Meta Productique	KmProd	France
22	Mestec	MESTEC	United Kingdom
23	NearSoft	MOM4	Bulgaria
24	Brighteye	Momentum	Belgium
25	Objective	Objective	Belgium
26	Siemens	Opcenter	Germany
27	Operator Systems	Operator	Denmark
28	Yokogawa	OpreX Transformation	Japan
29	Werum	PAS-X	Germany
30	PPI-Multitask	PC-Factory MES	Brazil
31	OSIsoft	PI System	USA
32	BM Vision	PlantMaster	Belgium
33	POMS Corp.	POMSnet Aquila MES	USA
34	PRODAC Systems	Prodac Systems	Israel
35	Doruk	ProManage	Turkey
36	PSI Metals	PSImetals	Germany
37	Qualist Technology	Qualist MES	Switzerland
38	Creative IT	Qubes	France
39	Savigent	Savigent	USA
40	Sepasoft	Sepasoft MES Suite	USA
41	sedApta	Shop Floor Monitor	Italy
42	Lighthouse	Shopfloor-Online	United Kingdom
43	Parsec Automation	TrakSYS	USA

Figure 1 Participating Vendors and their MES Solutions.

Vendor Information

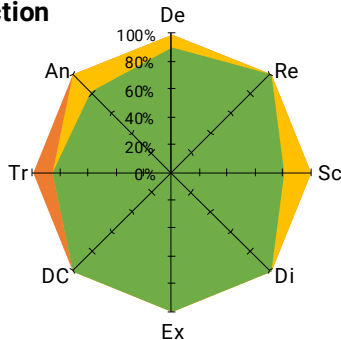
Vendor Name	NearSoft
Address	Triadiza 5A
City	Sofia
Country	Bulgaria
ZIP	1000
Contact	Vladimir Filipov
Phone	"+359889662446"
Email	sales@nearsoft.eu
Website	www.nearsoft.eu
Industry sector	Automotive* - Building/Infra* - Consumer Pack.Goods - Fabricated Materials* - Food/Beverage -
(* real business focus)	Home/Pers.Care - Machinery/Tooling* - Metals(prim.)* - Metals(sec.)* - Mining - Paper/Pulp - (Bio)Pharmaceutical* - Utilities/Public - Other: Maintenance for Shopping Malls

Solution Information

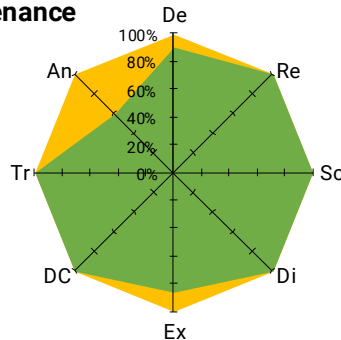
Solution Name	MOM4
Version	2.3
Release date	November 2019
License structures	Site, Function, Lease
Platforms - server	Windows 2012, Windows 2016, Windows 2019
Platforms - client	Windows 8, Windows 10, Linux
Databases (versions)	Oracle (11, 12), SQL server (2012, 2014, 2016, 2019)
Technology	MicroSoft platform, AJAX, HTML5
Architecture	Cloud architecture
SOA/Components	SOA, Use SOA component from others, SOA components used by others
Integration Approach	Model-centric approach
Multi Language	Multi Language - Full NLS - Unicode - User Own Language
Security	Active Directory (AD) - Monitor/log failed logins
Incident Management	Detect latent incident - Incident warning - Incident logging - Activate online tracing - De-activate online tracing - Monitor behavior

ISA-95 Compliance

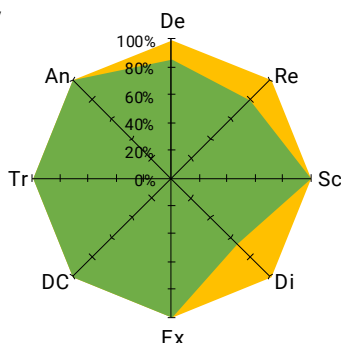
Production



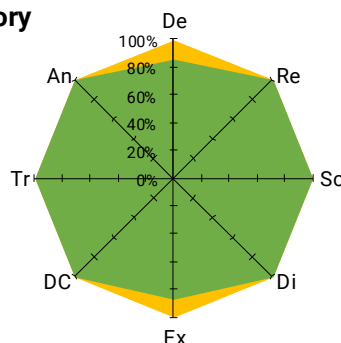
Maintenance



Quality



Inventory

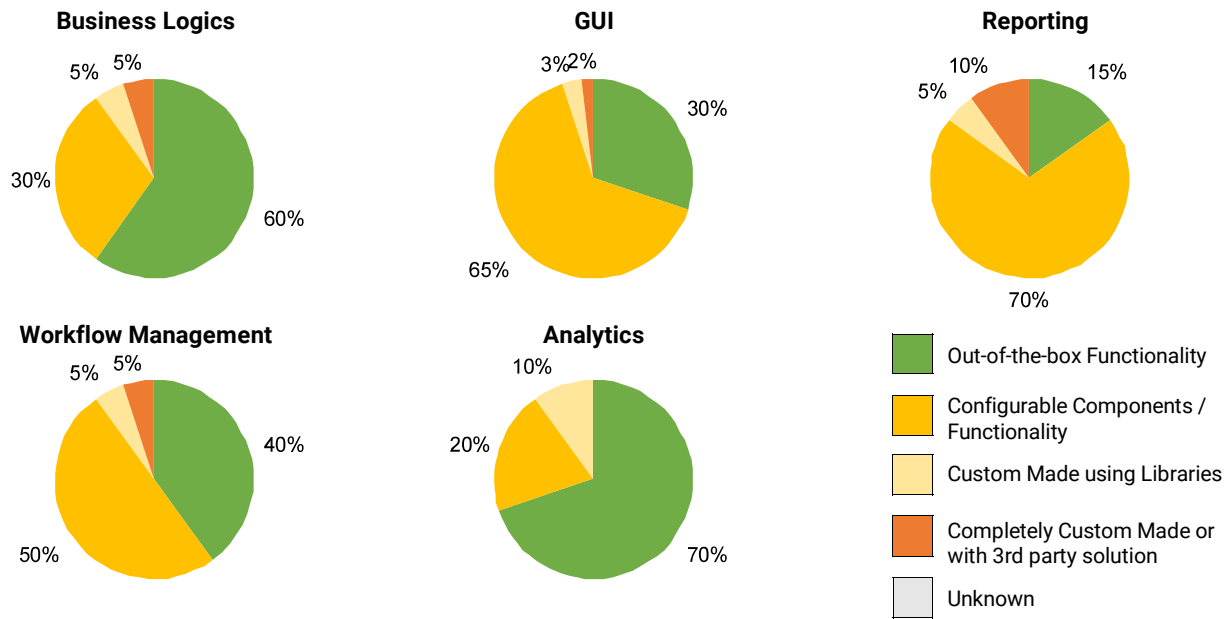


- Out-of-the-box or configurable
- Customized (completely or with libraries)
- With 3rd party or other solutions
- None

Legend

- De Definition Management
- Re Resource Management
- Sc Detailed Scheduling
- Di Dispatching
- Ex Execution Management
- DC Data Collection
- Tr Tracking
- An Analysis (Performance)

Configurability



Smart Manufacturing Roadmap

Technology Building Blocks	Description
Smart machines and advanced robotics	MOM4 DataCollector - Transforming legacy protocols (i.e. Fanuc FOCAS) and OPC DA to OPC UA/MTConnect providing data via web services. Supports Smart Terminals, based on tablets for manual data entry.
Industrial Internet of Things (IIoT)	MOM4 - an affordable means to retrofit legacy production systems with a wide array of sensors, and to provide the capability to securely and rapidly collect, store, and wireless transmit the data, enabling participation in the digital enterprise.
Business Process Orchestration tools	Existing basic tools for configuring PPR in MOM4. Graphical GUI under investigation, to be implemented in the near future. Providing B2MML REST and web services out-of-the-box.
Enterprise integration platforms, like ESBs, MSBs, API Managers, cloud services	Transfer to Microsoft Azure scheduled for September. Adding additional web parts and Wikis to our Enterprise Content Management System - MOM4. MS SharePoint integration.
Security services	Azure Security Center
Advanced analytics and Big Data tools	Integration with QlickView available. Selection and integration with other big data analytics tools is under investigation
Other functionality to support Smart Manufacturing / Industry 4.0 initiatives.	-

Smart Manufacturing

Related capabilities	Supported	Doc'd
Serialization	√	-
Configuration management of individually made products	√	-
Event triggered capabilities in the process workflow	√	-
Event triggered capabilities in the supply chain/supply network (with loop back workflows)	-	-
Automated, distributed decision support	-	-
Manage virtual product definitions to be used for simulation, optimization and decision support.	√	-

Related capabilities	Supported	Doc'd
Active Intelligence (opposite to passive information)	-	-
Manufacturing innovation, like what-if simulations, comparison of different resources, etc.	√	-

Production and Logistical Typologies

* Fit reduced to 3 (missing explanation)

Typology	Fit	Explanation (required if fit > 3)
Continuous Process	5	References in Minerals, Metals and Cement, Beverages
Batch/Semi Process	5	References in Primary Metals, Extrusion, Food & Beverages
Discrete Manufacturing	5	References in Secondary Metals, Automobile and Machinery
Make-to-Stock	4	References in Cement and Minerals
Make-to-Order	5	References in Primary and Secondary Metals, Paper, Food & Beverages, Pharma
Engineer-to-Order	5	References in Machinery
Assemble-to-Order	4	References in Automobile and Machinery

Quality Assurance Standards

QA Standard	Remarks	Certificate
CMM/CMMI	-	-
ISO/IEC 25051	-	-
ISO 9001	-	-
GAMP	-	-

Regulatory Compliance and Validation

Appl.	Description
√	Development according to GAMP
-	Deployed and validated in regulated environment (FDA)
√	21 CFR part 11 compliant
√	Validation dossier available

Regulatory Compliance (Other)

Solution is deployed in an environment with the following regulation(s):

Appl.	Regulation or Law
√	Serialization regulations
√	IATF 16949:2016 (Automotive)

ISO 50001 Compliance (Energy Management)

Supp.	Aspect	Doc'd
√	Energy use is measured, monitored and reported	-
-	Energy use is related to production, cleaning and maintenance activities	-
-	Energy use performance indicators (EnPI's) specified and calculated	-
-	Evaluation of actual versus planned energy use	-

Deployment

Methodology

Methodology

1. Requirement Specification - set of S95 compliant questionnaire and templates in MS Excel and System Architect (SysML).
2. Migration strategy based on maturity models such as "acatech Industrie 4.0 Maturity Index" or European Advanced Manufacturing Support Centre (ADMA).
3. Manufacturing Model Definition Tool for Materials, Equipment, Personal and Production Rules properties and algorithms in MS Excel.
4. MOM4Engineering for project configuration.
5. Pre-defined basic set of Displays and Reports.
6. Training courses and materials. We use our own tool MOM4Software that facilitate Lean Software Development, based on SCRUM, GAMP and S95. In addition: Microsoft Team Foundation Server (TFS) and Visual Studio Team System, SysML and UML, etc.

Tools	Description
Configuration tools	MOM4Engineering - S95, Communication, Report and System objects and properties. Import/Export in XML or CSV of objects and properties as well as display forms.
Workflow design and configuration tools	Configurable through Product Definition, Product Production Rules, Process and Product Segments as well as Segment Dependancies
Wizards to support configuration	Macros In MS Excel, import in MOM4
Tools to create project documentation	Templates for MS Word, Excel, Visio and Enterprise Architect. Help bulder
Tools to create interfaces	Content Management System with web parts. Page Builder with templates. Library of web parts(widgets), i.e. Table, Graphics, Gantt, Calendar, Pareto, etc.
Tools for migration and roll-outs	Tools to commpare objects and properties

Expertise for successful deployment

- Clear Business Requirments
- Management initiatives in place such as Lean, TQM, JIT, etc
- Management based on KPI and statistical analyses (Six Sigma).

Multi-site Deployment

Appl.	Aspect
✓	Suited for multi-site deployment
1	Count multi-site projects last 5 years
3	Average number of sites per project
60	Avg cost of last 2 sites (%) compared to first site
30	Avg. throughput time of last 2 sites (%) compared to first site
✓	Single (central) database with on-site deployments
✓	Support different requirements within same template

Strong points for multi-site deployment

MOM4 is a configurable solution based on the ISA 95 standard. MOM4Engineering is the administrator’s tool for all MOM4 products and is a menu driven configuration tool used to configure S95 business objects (Material Class, Materials, Equipment, etc.) and properties, process tags, language resource files, communication transport objects, user scripts, etc. For example, a customer can create and modify business objects for new equipment that will be automatically linked to the rest of the system. Using the MOM4PageBuilder toolkit, a user can create and customize displays/reports and make them available to other users. B2MML Web Services.

Product Development Policy

Type of Release	Supported	Backward Comp.
Major release	1 per year	✓
Minor release	4 per year	✓

Type of Release	Supported	Backward Comp.
Patches	1 per month	✓
Continuous (e.g. SaaS)	As needed	✓

Improvements

Version / Aspect	Description
In current version	Enterprise Content Management System, Run-time engine for C# scripts, Extended functionality for Statistical Process Control, Operational KPIs based on ISO 22400. 2D cutting optimization. CMMS, Enterprise, Asset Management, New SPC module
In next version	Extended MS Share Point integration, Simulation, Cloud.

Major Functions

Doc'd	Description
✓	MOM4Resources - Digital Twins, Material/Equipment/Personal Passports - S95
✓	MOM4Product - PDM/PLM/Recipes solution based on S95
✓	MOM4Planning - Infinite Detailed Planning and Scheduling
✓	MOM4Scheduling - Final Capacity Scheduling
✓	MOM4Execution - MES functionality - execution supervision and data collection
✓	MOM4Reports - Configurable tabular and graphical reports, PDF
✓	MOM4KPI - more than 60 Operational KPIs as defined by ISO/IEC 22400
✓	MOM4Maintenance - EAM/CMMS/FMS system
✓	MOM4Communication - maps external web services (B2MML) to S95 objects
✓	MOM4Engineering - configuration tool to build the Manufacturing/Maintenance Model
✓	MOM4OPC - OPC DA adapter
✓	MOM4BAPI - adapter supporting SAP BAPI
✓	MOM4DataBase - adapter for exchange information through db tables
✓	MOM4CutOptimizer - advance mathematical model for 2D cut optimization
✓	Shopping Mall Operations Management (EAM)
✓	MOM4Scale - for Weight and Dispensing

Industry Specific Processes

Doc'd	Solution
✓	Melt shop process for slabs and billets. Ferrous and Non-Ferrous Metals
✓	Electric Arc, Blast, VOD Furnaces
✓	Continuous Casting - Blooms, Billets, Slabs
✓	Slab/Billets Cutting and optimizations
✓	Reheating Furnaces Supervision
✓	Hot and Cold Rolling - Long Products and Coils. Ferrous and Non-Ferrous Metals
✓	Extrusion (Press) - bars and coils
✓	Drawing metalworking process
✓	Cleaning, Annealing and Pickling Lines and Bell Furnaces
✓	Coil Slitting and Cutting Optimization. Ferrous and Non-Ferrous Metals
✓	Fabricated Parts
✓	Weight and Dispensing. Scale Supervision
✓	Pharma - Mixers, Blending, Tableting, Coating, Primary and Secondary Packing
✓	Quality Assurance and InProcess Control
✓	Mechanical and Chemical Lab Analyses
✓	Facility Management - maintenance, security, cleaning, etc

Example of typical project

Customer	SofiaMed (Vialhalco)
Industry sector	Metals Industries (secondary)
Other	Nonferouse metals
Number of users	800
Implemented in	One or more sites (Enterprise)
Summary	<p>Three (3) MOM4 Implementations:</p> <ul style="list-style-type: none"> - Melt shop(Scrap Yard, 5 Electric Arc Furnaces, 4 Countinuos Casters, Billet and Slab Cutting, etc) - Rolling (RHF (1), Hot (1) and Cold Rolling (5), Annealing (8), Pickling (2), Slitting (4), Cutting (3), QA, Packing, etc) - Extrusion (RHF, Presses, Drawing (3), Rolling (1), Cutting, Fabricated Parts, Platting, QA, Packing) etc) <p>Production Planning Final Capacity Scheduling Schedule and Cut Optimization Re-scheduling Execution and Data Collection Reporting & Analyses Operational KPIs Equipment Maintenance and Dye management Quality Control – Visual, Chemical and Mechanical OPC communication with automation systems Integration with SAP ERP</p>

Helpdesk and local 24/7 Support

(v) - by vendor (p) - by system integrator partner

Region	Helpdesk (v)	Helpdesk (p)	Support (v)	Support (p)
North America	-	-	-	-
South America	-	-	-	-
Europe	√	√	√	√
Middle East and Africa	-	-	-	-
Asia, Australia and Pacific	-	-	-	-

Support

Appl.	Support options
√	Installations and upgrades
√	Remote monitoring and management
√	Back-ups and restores

Interfaces

Appl.	Standards for interfacing
√	OPC - UA
√	OPC DA/HDA/...
-	MQTT
√	B2MML
√	BatchML
-	PackML
-	SECS/GEM
-	MIMOSA
√	ODBC
√	Windows Communication Foundation (WCF)

Appl.	Middleware, Enterprise/Manufacturing service bus	Version
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- ✓ Biztalk (Microsoft)
- TIBCO (TIBCO) -
- Websphere (IBM) -
- Jboss (Red hat) -
- WebLogic (Oracle) -
- ✓ Netweaver PI (SAP)
- ATS Bus (ATS Global) -
- ✓ BAPI (SAP)

Supp. Data communication

- ✓ Handle synchronous communication
- ✓ Handle a-synchronous communication
- ✓ Make logging of all communications (alarm, failures, etc)

USP's Product & Vendor

Type	Description
Product	Future proof! MOM4 covers all aspects of Operation Management and enables stepwise adoption of Industry 4.0. The same platform with different configuration are used for Production, Quality, Maintenance and Inventory. MOM4 is entirely build on open standards such as RAMI 4.0 / ISO 62264, B2MML, OPC, Web Services, etc .
Product	Configurable! Using the MOM4Engineering toolkit, a user can create and customize displays/reports and make them available to other users. Information is collected and correlated from all plant operations.
Product	Knowledge! A broad understanding of manufacturing, build on more than 22 years of experience in MES, applied to the business and integration needs.
Vendor	NearSoft is an innovative, hi-tech software company that provides methodology and technology for Lean 6-Sigma real-time collaborative processing of the production information inside an enterprise at reasonable price. We are focused on manufacturing operations excellence achieved with state of the art software tools and methodologies. MOM4 enables Industry 4.0, by orchestrating IoT and IoS.