

Inventory Management System and Method

Field of the Invention

- 5 The present invention relates broadly to an inventory management system and method.

Background

- 10 In a classic purchasing approach, the steps involved are typically, to analyse inventory and derive reorder quantity; to acquire quotations; to analyse the quotations; to order stocks from suppliers based on the analysis; and lastly to receive the stocks delivered to the assembly line or storage based on the instructions of the purchaser. Quality control may be practised during the receiving stage. Days may be required simply to check stock, stock usage may take weeks, issuing purchase order (PO) may take days and
- 15 material planning may take weeks. Contributing to the low time efficiency are factors such as many vendors, heavy manpower, manual steps, and paperwork which may result in shortage a surplus of stock inventory.

Summary of the Invention

- 20 In accordance with an aspect of the present invention, there is provided an inventory management system comprising, one or more storage structures for location at one or more customer sites, one or more scanner systems for location at the customer sites for scanning data associated with stock movements into and out of the respective storage
- 25 structures, an inventory database for maintaining inventory data based on the scanned data, and a computer system for location at a supplier site for issuing an alert if reorder levels of the respective stocks for respective customers are reached based on the scanned data stored in the inventory database.
- 30 The computer system may calculate a reorder quantity for respective stocks based on predetermined maximum stock levels associated with the respective stocks for the respective customers.

The reorder quantity may be the difference between current levels of the respective stocks, the current levels being equal to or smaller than the respective reorder levels, and the respective maximum stock levels.

- 5 The scanner systems may comprise barcode readers.

The computer system and the scanner system may be connected via the Internet.

The scanner systems may be personal computer (PC) based systems.

10

The computer system may comprise a web-based application program.

The computer system may comprise a web-based user Interface.

- 15 The scanner systems may further comprise an interface for entering quality control data associated with the respective stocks.

The quality control data may be linked to the scanned data of the associated respective stocks and stored in the inventory database for traceability.

20

The quality control data may be communicated between the scanner systems and the computer system.

- 25 The storage structures may comprise rack structures, each rack structure having a plurality of bins for storage of different stocks.

- 30 In accordance with another aspect of the present invention, there is provided an inventory management method comprising, scanning data associated with stock movements into and out of storage of respective stock at one or more customer locations, maintaining inventory data based on the scanned data, and issuing an alert if reorder levels of the respective stocks for respective customers are reached based the scanned data stored in the inventory database.

The method may comprise calculating a reorder quantity for respective stocks based on predetermined maximum stock levels associated with the respective stocks for the respective customers.

- 5 The reorder quantity may be calculated as the difference between current levels of the respective stocks, the current levels being equal to or smaller than the respective reorder levels, and the respective maximum stock levels.

The scanning of the data may comprise utilising barcode readers.

10

The inventory data may be maintained utilising data transfer over the Internet.

The scanning of the data may comprise utilising personal computer (PC) based systems.

- 15 The method may further comprise entering quality control data associated with the respective stocks in the inventory database.

The quality control data may be linked to the scanned data of the associated respective stocks and stored in the inventory database for traceability.

20 **Brief Description Of The Drawings**

Embodiments of the invention will be better understood and readily apparent to one of ordinary skill in the art from the following written description, by way of example only and in conjunction with the drawings, in which:

25

FIG. 1 is a schematic diagram illustrating an inventory management system and process flow according to an example embodiment of the present invention.

- 30 FIG. 2 is a schematic drawing of a rack comprising a plurality of cells for housing stocks used in implementation of an example embodiment of the present invention.

FIG. 3 is a network diagram of the inventory management system of an example embodiment of the present invention.

FIG. 4 is a diagram illustrating the user login interface for use in implementation of an example embodiment of the present invention.

5 FIG. 5 is a diagram illustrating the main menu interface for use in implementation of an example embodiment of the present invention.

FIG. 6A is a diagram illustrating the graphical interface of an inventory report by part listing for a selected customer that is used in the implementation of an example embodiment of the present invention.

10

FIG. 6B is a diagram illustrating another graphical interface of an inventory report by part listing for a selected customer that is used in the implementation of an example embodiment of the present invention.

15 FIG. 7 is a diagram illustrating the graphical interface of an inventory movement report by customer listing for a selected customer within a selected time frame that is used in the implementation of an example embodiment of the present invention.

20 FIG. 8A is a diagram illustrating another main menu interface for use in implementation of an example embodiment of the present invention.

FIG. 8B is a diagram illustrating the graphical interface of a registered user details report for use in implementation of an example embodiment of the present invention.

25 FIG. 9 is a diagram illustrating the graphical interface that is used for user details updating and security settings in the implementation of an example embodiment of the present invention.

30 FIG. 10 is a diagram illustrating the graphical interface of a part details report for use in implementation of an example embodiment of the present invention.

FIG. 11 is a diagram illustrating the graphical interface that is used for inventory updating in the implementation of an example embodiment of the present invention.

FIG. 12 is a diagram illustrating the graphical interface of a customer details report for use in implementation of an example embodiment of the present invention.

5 FIG. 13 is a diagram illustrating the graphical interface that is used for customer details updating in the implementation of an example embodiment of the present invention.

FIG. 14 is a diagram illustrating the main menu interface that is used for a PC-based computer system in the implementation of an example embodiment of the present invention.

10

FIG. 15 is a diagram illustrating a dialog box that is used for capturing data during product receipt in the implementation of an example embodiment of the present invention.

15 FIG. 16 is a diagram illustrating a dialog box that is used for capturing data during product issue in the implementation of an example embodiment of the present invention.

FIG. 17 is a diagram illustrating a dialog box that is used for configuring user details in the implementation of an example embodiment of the present invention.

20

FIG. 18 is a diagram illustrating a dialog box that is used for adding user details in the implementation of an example embodiment of the present invention.

25 FIG. 19 is a diagram illustrating a dialog box that is used for editing user details in the implementation of an example embodiment of the present invention.

FIG. 20 is a schematic drawing of a computer system for implementing the method and system according to an example embodiment.

30 Detailed Description

The example embodiments discussed in the present invention provide a method and system for inventory management in which the shortage of stocks may be automatically detected and replenished by placing orders in real time.

The definition of 'stock' as used in the description is a package containing a plurality of commodity items or parts (e.g. C-parts) or it may be the part itself.

5 With reference to FIG. 1, an overview of an inventory management system and process flow in the example embodiment will first be described. At a customer plant 100, including an assembly line 102 and bin rack 104 for storage of a relevant stock, scanner readings are conducted utilising a personal computer (PC) based system 106. The scanner readings are performed each time stock is taken from or supplied to individual
10 ones of the bins of the bin rack 104.

Based on the scanner readings processed and stored on the PC based system 106, stock levels are uploaded to a supplier server 108, using the internet in the example embodiment. The instance at which uploading is performed in the example embodiment
15 is described below. At the supplier site 110, inventory levels as well as reorder levels and maximum stock levels for each customer are maintained on the supplier server 108. Based on existing supply contractual arrangements between the supplier and individual customers, the supplier server 108 also instigates reordering of required stock. Details of the instigated reordering are described in detail below.

20

Based on the instigated order, the required stock is obtained from a warehouse 112, which is located at the supplier site 110 in the example embodiment, and the preparation for and shipment of the stock 114 to the customer plant 100 occurs.

25 Upon arrival of the stock 114 at the customer plant 100, stock re-supplied to individual ones of the bins of the bin rack 104 is monitored through scanner readings utilising the PC based system 106. At this junction, manual/visual quality control measures may be implemented, the results of which may be entered as data into the PC based system 106 alongside with the scanned information. The findings of the quality control that are linked
30 to scanned data such as batch numbers of the relevant stock can be uploaded to the supplier server 108. This uploaded data can be used at the supplier site 110 for feedback to the production of the actual stock. Similarly, if quality control measures are taken upon removal of stock with associated scanner readings from individual ones of

the bins of the bin rack 104, prior to, during, or after use of the stock in e.g. the assembly line 102, this information may be similarly stored with and linked to the scanned data.

5 Therefore, the link between the findings of quality control and scanned data such as batch number enables feedback to the production of the actual stock at the supplier site 110. This provides the inventory management system with traceability to e.g. identify stock used on a particular day of production based on the scanner data such as batch number.

10 The operation of the PC based system 106 in the example embodiment is described in more detail as follow. In FIG. 2, a bin rack 200 has a plurality of cells, with a bin 206 for containing stock rests in each individual cell 202 on the rack. A scanner 204 associated with a personal computer (PC) 205 (106 in FIG. 1) is installed on the rack unit in the example embodiment. Scanning is performed for each and every package of incoming
15 and outgoing stock. In the example embodiment, scanned information is used to account for the total quantity of the particular stock. Scanning an incoming stock increases the stock quantity by one unit whereas scanning an outgoing stock decreases the stock quantity by one unit.

The scanner 204 may work, for example, on the basis of Radio Frequency Identification
20 (RFID) Technology and/or Barcode Technology. Depending on the technology, RF Tags or barcode labels are pasted on each stock. The scanner 204 detects the information specific to each stock as the stock with RF Tag or barcode label is placed in or out of each bin 206. In the example embodiment the RF Tag or barcode label of each stock may one by one be manually placed in strategic disposition to allow the scanner 204 to
25 capture its information.

FIG. 3 shows the network diagram of the inventory management system 300 implemented in the example embodiment. The system 300 comprises a supplier computer network 304 and a customer computer network 302. It would be appreciated
30 that in practice the supplier computer network 304 can support more than one customer computer network.

Network 304 comprises a supplier server 310 (108 in FIG. 1) of the inventory management system. The supplier server 310 maintains a central database 310 to store

inventory information collected by network 302 and inventory information of the supplier's own stock. A user terminal 306 is connected to the supplier server 310 to enable users at the supplier end to monitor and configure user accounts and inventory levels of the customers and of the supplier itself. It would be appreciated that in practice
5 there can be more than one user terminals 306 interconnected as a Local Area Network (LAN) with the supplier server 310.

The supplier server 310 also hosts a website accessible by web browsers to enable customers to view their inventory information online from their own computer network
10 e.g. network 302 or from a remote location using a remote stand alone computer 314. For instance, remote access through computer 314 may be required when a customer at a remote facility with Internet access wishes to check the status of its inventory at its subsidiary plants. The server 310, in the example embodiment, alerts users of the network 304, e.g. staff members of the supplier, if a reorder level has been reached for a
15 particular stock for a particular customer. The alert may be in the form of an e-mail to the appropriate staff member. Details of the web based application program such as the user interfaces of the website and security features will be discussed below.

Network 302 comprises a scanning system comprising a PC based computer system
20 (PC) 205 with scanning capabilities. The details of the scanning system is described earlier in the system illustrated by FIG. 2. It would be appreciated that in practice there can be one or more PCs 205 interconnected as a LAN in the customer network 302 where each PC 205 can be used for scanning the stocks on one or more racks (200 in FIG. 2). On top of scanning stocks and recording the scanned data, a function of the PC
25 205 is to upload the scanned data to the central database 310 maintained by the supplier server 310.

In the example embodiment, the web based application program contains report viewing
30 interfaces with selectable filtering options and configuration interfaces. The interfaces are web pages running on a web browser of a user's personal computer where the personal computer is able to access the supplier server (108 in FIG. 1; 310 in FIG. 3) via the Internet. On these interfaces, there exists computer mouse cursor clickable, keyboard linked and/or computer keyboard hotkey enabled buttons, drop down menus,

calendar menus, textboxes, edit boxes, radio buttons, check boxes, password enabled textboxes ... etc for user interaction with the program. Only authorised and registered users will be able to access the program. There are three types of user access rights, administrator, supplier user and customer in the example embodiment.

5

FIG. 4 illustrates a user login interface 400 hosted by the supplier server (108 in FIG. 1; 310 in FIG. 3) comprising textboxes for input of a user login identifier (ID) 402 and a user login password 404, which may be alphanumeric numbers. The user ID 402 and user password 404 may be set as mandatory input fields. A maximum number of characters for the login password 404 and user identifier 402 may be imposed. A Login button 406 is present for the user to click on to execute the login. A Cancel button 408 is present for the user to click on to end the login session. The program will end after the Cancel button 408 is clicked.

15 As illustrated in FIG. 5, depending on the access right of a user, a main menu interface 500 may be one of the first interface after the user logs in. The main menu interface 500 comprises user selectable menu items (hyperlinks) such as 'Report' 502 for inventory reporting features, 'Upload Data' 504 for uploading data to the database (312 in FIG. 3) maintained by the supplier server (108 in FIG. 1; 310 in FIG. 3), 'Configuration' 506 for system configuration features, 'Change password' 508 for users to change password and 'Logout' 510 for users to logout of the application program.

25 If 'Change password' 508 is clicked by the user, an interface will appear for the user to change his password. There are two textboxes for typing in the new password. The second textbox is for the user to type the same password so as to confirm the first password typed. A Cancel button is present for the user to click on to exit the password changing session without change of password. An OK button is present for the use to click on to effect the change in password.

30 In the example embodiment, if a system administrator with administrator rights logs in, the main menu interface will appear. The system administrator can see and access all the menu items as described earlier. If a customer user with customer rights or supplier user with supplier user rights logs in, the main menu will be slightly modified and only

shows menu items, 'Report' 502, 'Upload Data' 504, 'Change password' 508 and 'Logout' 510.

5 Selecting 'Report' (502 in FIG. 5) in the main menu interface 500 will call out interfaces for displaying inventory reports. The type of reports displayed for user viewing/printing can be based on user selectable criteria such as by part listing or by customer listing. Customer listing is only accessible by suppliers. In the example embodiment, all users have access right to view/print reports. In the description of reports as follow, the display of one or more information details e.g. Quantity Out, Part Number (No.), Reorder Level
10 ... etc in any report is not fixed. The example reports discussed only indicate one possible combination of presenting the information details.

With reference to FIG. 6A, when 'Report' is selected under administrator and supplier user rights by an administrator or a supplier user, an interface 600 for displaying an example report 618 appears. There is a drop down menu 602 for users to select the
15 required customer. There is also a clickable hyperlink 'Back to Config' 616, which upon clicking, will cause the present interface to change and display the main menu interface 500 corresponding to the access rights of the user. Once the customer is selected in the drop down menu 602, the screen will display thereport 618 of the customer's inventory and the details may first appear as sorted in ascending order of the batch number 604.
20 Other details that are capable of being sorted electronically by ascending/descending numbering or alphabetical order are 'Part Number' 606, 'Part Description' 608, and 'Qty (Quantity)' 610. These details may be in alphanumeric, date or numeric format. A maximum number of characters for these details may be imposed. 'Batch Number' 604, 'Part Number' 606 and 'Part Description' 608 are as their name implies. 'Quantity' 610
25 refers to the quantity of the remaining stocks. In addition, there is a last row 614 dedicated to indicate the total amount of stock quantity left in the customer's inventory. The example report 618 illustrated in FIG. 6A is a summary report of the customer's current inventory level. Furthermore, when the Submit button 612 is clicked, the interface illustrated in FIG. 7 that is specific to the selected customer will appear.

30

With reference to FIG. 6B, when 'Report' is selected under customer rights by a customer user, an interface 650 for displaying an example report 652 appears for the customer 668. The screen will display the stock quantity details of the customer and these details may first appear as sorted in ascending order of the batch number 654.

Other details that are capable of being sorted electronically by ascending/descending numbering or alphabetical order are 'Part Number' 656, 'Part Description' 658, and 'Qty (Quantity)' 660. These details may be alphanumeric, date or numeric format. A maximum number of characters for these details may be imposed. 'Batch Number' 654, 'Part Number' 656 and 'Part Description' 658 are as their name implies. 'Quantity' 660 refers to the quantity of the remaining stocks. In addition, there is a last row 664 dedicated to indicate the total amount of stock quantity left in the customer's inventory. Also, there is a clickable hyperlink 'Back to Main' 666, which upon clicking, will bring the present interface back to the main menu interface 500. Furthermore, there is a Go to details button 670 that can be clicked on to bring on a next interface, which is illustrated in FIG. 7, for displaying more detailed reports filtered by one or more details. The example report 652 illustrated in FIG. 6B is a summary report of the customer's current inventory level.

In the example embodiment, 'Reorder Level' is an optional column header that can be added in the reports illustrated in FIG. 6A and FIG. 6B to indicate the inventory level for which reordering will take place if the quantity 610 or 660 of the particular stock falls below this level. In the example embodiment, 'Max Level' is another optional column header that can be added in the reports illustrated in FIG. 6A and FIG. 6B. 'Max Level' refers to an agreed maximum stock level for each particular part. In the example embodiment, a seamless, paperless reordering process is implemented. More particularly, rather than requiring additional analysis and/or correspondence between the supplier and the customer at the time a low stock level triggering reordering has been identified, in the example embodiment key parameters of the reordering processes are initially agreed between the supplier and the customer. In particular, in one example embodiment the 'Reorder Level' and 'Max Level' are contractually agreed between the supplier and the customer for each relevant part. As a result, whenever reordering is triggered at or below the 'Reorder Level', reordering of stock to replenish to the 'Max Level' will occur.

30

It will be appreciated by a person skilled in the art that this process implementation in the example embodiment can provide a number of significant advantages, both to the supplier and the customer. Those advantages include avoidance of the additional analysis and/or correspondence between the supplier and customer each time a reorder

is triggered. Furthermore, the example embodiment provides "certainty" for the customer that they will not be provided with excessively large reorders of stock, which may occur where the analysis required in previous processes for determining the reorder level proves to be incorrect. For example, where a high demand was predicted at the time of reorder, but subsequently an assembly line breakdown occurs, this would result in unnecessarily high overheads in previous processes. In the example embodiment, the parameters of the contractual arrangement between the supplier and the customer may be periodically reviewed at the convenience of either or both of the parties, rather than being subjected to a "forced" review dictated by the auto-triggered in previous processes, which may often occur at times inconvenient to one or both of the parties, and potentially cause crucial and expensive delays in the overall inventory management.

FIG. 7 illustrates an interface 700 for displaying a detailed report 736 of a pre-selected customer's 702 inventory. There are calendar menus 'From Date' 704 and 'To Date' 706 for users to select a range of dates to display stock details in the report 736. Drop down menus 722 and 724 are included into the report 736 to allow display of reports filtered by part number and batch number respectively. There are also two radio buttons, one for filtering records for incoming stock quantity input 726 and another for stock quantity output 728. To display the report 736 on the interface 700, all empty fields in the textboxes, drop down menus etc must be filled. Next, the submit button 732 must be clicked to process the filled in fields and to display the report 736. The inventory movement details of the report 736 may first appear as sorted in ascending order of the batch number 708. Depending on the radio button selected, details capable of being sorted by ascending/descending numbering or alphabetical order are the 'Part Number' 710, 'Part Description' 712, 'Quantity In' 714 and 'Date (indicating Quantity In Date)' 716, 'Quantity Out' (not shown in FIG. 7) and 'Date (indicating Quantity Out Date)' (not shown in FIG. 7). FIG. 7 illustrates the case where radio button 726 is selected, thus only 'Quantity In' 714 and its corresponding quantity in 'Date' 716 are shown. These details may be in alphanumeric, date or numeric format. A maximum number of characters for these details may be imposed. 'Quantity In' 714 refers to the order quantity received/stored at the storage (104 in FIG. 1) or assembly line (102 in FIG. 1). 'Quantity Out' refers to the quantity that is used/removed from the storage (104 in FIG. 1) or assembly line (102 in FIG. 1). Accordingly, 'Date (indicating Quantity In Date)' 716 and 'Date (indicating Quantity Out Date)' refer to the dates where stocks are received/stored

and used/removed respectively. In addition, there is a last row 730 dedicated to indicate the total amount of stock quantity input at the customer site within the range of dates selected. Depending on user access rights, the back to summary button 734 is clicked for returning back to the interface displaying the summary report as illustrated in FIG. 6A or FIG. 6B.

Referring back to the main menu interface (500 in FIG. 5), menu item 'Configuration' (506 in FIG. 5) is only available to users with administrator rights. With reference to FIG. 8A, when 'Configuration' (506 in FIG. 5) is selected, another menu interface 850 will appear. The menu items are 'Part Master' 852, 'Customer Master' 854, 'User Configuration' 856 and 'Main Menu' 858. Clicking 'Part Master' 852 will open the interface illustrated by FIG. 10. Clicking 'Customer Master' 854 will open the interface illustrated by FIG. 12. Clicking 'User Configuration' 856 will open the interface illustrated by FIG. 8B. Clicking 'Main Menu' 858 will open the menu interface (500 in FIG. 5) illustrated by FIG. 5.

In FIG. 8B, there exists a registered user details interface 800 that allows authorised users to search/sort by 'User ID' 802, and/or 'Customer' 806 so as to view the individual information of registered users of the application program. User ID refers to an identifier used to indicate the user. There are two drop down menus 824 and 826 for selecting 'User ID' 802 and 'Customer' 806 respectively. There is also a textbox 830 for typing in the user name to be searched. After the user fills in the search entry and made his or her selection, a report 832 containing user details filtered by customer and/or username and/or user ID will be displayed once a search button 828 is clicked. The Back to Config button 834 when clicked will cause the present interface 800 to change and display the menu interface (850 in FIG. 8A) as illustrated by FIG. 8A. The report details may first appear as sorted in ascending order of the 'User ID' 808 if the 'User ID' 808 is set as a variable with type capable of chronological arrangement (e.g. numeric, alphanumeric, ..., etc.). Each user record may be denoted by details such as the 'User ID' 808, the 'User name' 810, 'Access Rights' 812 and the 'Customer Name' 814. These details may be in alphanumeric, date or numeric format. A maximum number of characters for these details may be imposed. In addition, there are two extra columns in the report 832, 816 and 818, and two buttons, 820 and 822. One button 820 is to enable the selection of edit user record and the other button 822 is to enable the selection of delete user record. Each row contains the two buttons. The purpose of button 834 is to open the interface

illustrated by FIG. 9 for creating new user record. Clicking button 820 will open the same interface illustrated by FIG. 9 but the purpose is to edit the existing user record in that row.

- 5 With reference to FIG. 9, a create/edit interface 900 where the administrator can register new user details or edit existing user details is shown. Each entry can be created/edited through textboxes and drop down menus for details such as the 'User ID' 902, the 'User Name' 904, 'Password' 906, 'Confirm Password' 918, 'Access Rights' 908 and 'Customer (Customer name)' 910. As these information is crucial in the context of inventory
- 10 management, each of these details may be classified as a mandatory input field. The first textbox 'Password' 906 is for the user to key in the password in the first instance. The second textbox 'Confirm Password' 918 is for the user to key in the same password again so as to confirm by comparing the two passwords that no mistakes are made in keying the password in the first textbox 'Password' 906. After all the textboxes and drop
- 15 down menus are filled, the new/edited user record is saved by clicking the Save button 912. The save function can only proceed provided the two passwords are the same. A check box 914 is also included in this interface to enable the administrator to block out a particular user. For example, if a user misuses the system, checking the check box 914 will disallow the user's access to all features of the program. A cancel button 916 is
- 20 present for the user to click on to end the user details configuration session. Ending the session will open the interface illustrated by FIG. 8B.

- Similar configurations pertaining to registered user information as discussed in FIG. 8B and FIG. 9 can be extended to parts or stocks. In FIG. 10, there is a part details interface
- 25 1000 where authorised users can display a report 1020 by clicking search button 1022 after filtering the report 1020 by 'Part ID', selected through a drop down menu 1002, or 'Part number', entered through a text box 1004. Part ID refers to an identifier indicating a certain type of part. Part number refers to a serial number given to each part regardless of its type. The Back to Config button 1024 when clicked will cause the present interface
- 30 1000 to change and display the menu interface (850 in FIG. 8A) as illustrated by FIG. 8A. The report 1020 of part details may first appear as sorted in ascending order of the 'part ID' 1006 if the 'part ID' 1006 is set as a variable with type capable of chronological arrangement (e.g numeric, alphanumeric, ..., etc.). Other part details are 'Part Description' 1008 and 'Reorder Level' 1010. These details may be in alphanumeric, date

or numeric format. A maximum number of characters for these details may be imposed. The same as described earlier, 'Reorder Level' 1010 is the inventory level for which reordering will take place if the quantity of the particular stock falls below this level. In addition, there are two extra columns in the report 1020, 1012 and 1014, and two
5 buttons, 1016 and 1018. One button 1016 is to enable the selection of edit part record and the other button 1018 is to enable the selection of delete part record. Each row contains the two buttons. The purpose of button 1026 is to open the interface illustrated by FIG. 11 for creating new part record. Clicking button 1016 will open the same interface illustrated by FIG. 11 but the purpose is to edit the existing part record in that
10 row.

With reference to FIG. 11, there is a create/edit interface 1100 for the administrator to register new part details or edit existing part details. Each entry can be created/edited utilising textboxes 1102, 1104 and 1106 for details such as the 'Part Number', 'Part Description' and 'Reorder Level' respectively. As such information is crucial in the
15 context of inventory management, each of the details may be classified as a mandatory input field. A Save button 1108 is present for the user to click on to save details typed into the textboxes. A Cancel button 1110 is present for the user to click on to end the part details configuration session.

20 Besides the configuration interfaces for user details and part details, there are also customer interfaces, one for reporting individual customer details (as shown in FIG. 12) and another one for creating customer record or editing customer record (as shown FIG. 13).

In FIG. 12, there is a customer details interface 1200 in which authorised users can
25 display a report 1202 by clicking search button 1204 after filtering the report 1202 by 'Customer ID', selected through a drop down menu 1206, or 'Customer name', entered through a text box 1208. Customer ID refers to an identifier to indicate a certain type of customer. The Back to Config button 1210 when clicked will cause the present interface 1200 to change and display the menu interface (850 in FIG. 8A) as illustrated by FIG.

30 8A. The report 1202 of customer details may first appear as sorted in ascending order of the 'Customer ID' 1212 if the 'Customer ID' 1212 is set as a variable with type capable of chronological arrangement (e.g numeric, alphanumeric, ..., etc.). The other customer detail is 'Customer Name' 1214. This detail may be in alphanumeric, date or numeric format. A maximum number of characters for the details of this interface may be

imposed. In addition, there are two extra columns in the report 1202, 1216 and 1218, and two buttons, 1220 and 1222. One button 1220 is to enable the selection of edit customer record and the other button 1222 is to enable the selection of delete customer record. Each row contains the two buttons. The purpose of button 1224 is to open the interface illustrated by FIG. 13 for creating new customer record. Clicking button 1220 will open the same interface illustrated by FIG. 13 but the purpose is to edit the existing customer record in that row.

With reference to FIG. 13, there is a create/edit interface 1300 for the administrator to register new customer details or edit existing customer details. Each entry can be created/edited utilising textboxes 1302 and 1304 for details such as the 'Customer ID' and 'Customer Name' respectively. As such information is crucial in the context of inventory management, each of these details may be classified as a mandatory input field. A Save button 1306 is present for the user to click on to save details typed into the textboxes. A Cancel button 1308 is present for the user to click on to end the customer details configuration session.

In the example embodiment, the PC-based system (205 in FIG. 2) at the customer site comprises a computer software application for execution on the PC. This computer software application establishes connection from the PC-based system (205 in FIG. 2) to the supplier computer system for the purpose of updating the supplier computer system with the stock quantity status at the customer site.

As shown in FIG. 14, the main menu dialog box 1400 in the example embodiment comprises four buttons, namely User Admin 1408, Product Receipt 1402, Product Issue 1404 and Exit 1406. Authorised user with Product Receipt rights must first login to the system. The login interface is similar to the one described in FIG. 4 but appears as a dialog box instead of a web page. The Exit button 1406 is for ending the program whereas the User Admin button 1408 opens up more dialog boxes to enable the administrator to add, delete or edit existing user records.

Similar to the web based application, in the example embodiment this PC based program has three types of rights, administrator, supplier user and customer user. The first display after an administrator logs in is the main menu dialog box illustrated by FIG.

14. The first display after a supplier user logins is the same as the main menu dialog box illustrated by FIG. 14 but without the User Admin button 1408. The first display after a customer user logins is the dialog box illustrated by FIG. 16.

When the Product Receipt button 1402 is clicked, with reference to FIG. 15, a dialog box 1500 will show up with a textbox 1502 for displaying captured data. Presuming a stock is received, the user uses a cabled barcode scanner connected to the PC to scan the barcode label on a stock. The captured data will appear in the product code textbox 1502. Once the system successfully captures and saves the data, the system will display a pop-up message "Data Saved", thus indicating that the scanned stock is received.

Users can click on the Switch to Delete button 1506 to delete previous entries that are incorrectly scanned. For example, after the button is clicked, a list with selectable entries scanned previously on the same day may be displayed for the user's deletion. Users can only delete items that are incorrectly scanned in the same day. Uploading of the scanned data to the supplier computer system is done whenever a user login into the computer software application. The user can also click the upload button 1508 to trigger uploading any time the user desires. The Exit button 1504 when clicked exits the current dialog box and displays the main menu dialog box (1400 in FIG. 14) on the display screen.

When the Product Issue button 1404 is clicked or if a customer user logins, with reference to FIG. 16, a dialog box 1600 will show up with a textbox 1602 for displaying captured data. The user then uses the cabled barcode scanner connected to the PC to scan the barcode label on the stock. The captured data will appear in the product code textbox 1602. Once the system successfully captures and saves the data, the system will display a pop-up message "Data Saved", thus indicating that the scanned stock is issued out. The Switch to Delete 1606 and Upload 1608 buttons of the Product Issue dialog box 1600 function in the same manner as in the Product Receipt dialog box 1500. The Exit button 1504 however will exit to the main menu dialog box (1400 in FIG. 14) if the user logging in is an administrator or a supplier user. Otherwise, it is the customer user who logins, the program will exit to the login dialog box.

The captured data may be saved in a text file in the format as follows.

TWKL011408030769*0515-4556*-2000,17/12/2004 11:20:22

This file can be uploaded to the customer server of the web-based system comprising of the customer and supplier servers as described earlier.

5

After an administrator clicks the User Admin button (1408 in FIG. 14) in the main menu dialog box (1400 in FIG. 14), a dialog box 1700 as shown in FIG. 17 appears. There are six buttons in the dialog box 1700, namely the Add New User button 1702, Edit User button 1704, Delete User button 1706, Apply button 1708, OK button 1710, Cancel button 1712. There is also a list of users 1714 listing down all the added users of the program.

10

Furthermore, there is a textbox 1716 for indicating the directory of the data file in the hard disk of the personal computer (205 in FIG. 2) that contains the list of users 1714.

15

Moreover, there is a user group drop down menu 1718 for selecting/indicating a user group. When the upload function is invoked, all scanned data of the system would be uploaded to part of a database dedicated to store scanned information of the selected user group. In the example embodiment, the definition of a user group is a group of users with the same access rights and the same job scope.

20

In addition, there is a textbox 1720 indicating the Default Upload User ID. The function of the textbox 1720 for Default Upload User ID is to indicate the user, which the administrator wishes to set as the default user. The default user group's database storage space will be the active data storage space of scanned data for whoever logging into the system. The purpose is to enable a supplier user to perform product receipt into the default user group's account.

25

The Add New User button 1702 when clicked calls out another dialog box for adding new users as shown in FIG.18. The Edit User button 1704 when clicked calls out another dialog box as shown in FIG.19 for editing user details. The Apply button 1708 applies all changes made in this dialog box 1700 and the dialog boxes as shown in FIG. 18 and FIG. 19. The OK button exits the dialog box 1700 and applies all changes made in this dialog box 1700 and the dialog boxes as shown in FIG. 18 and FIG. 19. The Cancel

30

button 1712 exits the dialog box 1700 without applying any changes. To delete a user, first a user in the list 1714 must be selected then the user that is selected can be deleted by clicking User button 1706.

5 FIG. 18 shows a dialog box 1800 for adding new users into the list 1714. It comprises 3
textboxes, 1802, 1804 and 1806, which allows the administrator to add in new user ID,
password and confirmation of password respectively for the new user. It also comprises
a drop down menu for selecting the user's assigned access rights 1808 (administrator,
supplier user or customer user) and a two buttons, the OK button 1810 and Cancel
10 button 1812. The OK button exits the dialog box 1800 and applies all changes made in
the dialog box 1800. The Cancel button 1812 exits the dialog box 1800 without applying
any changes. The user group drop down menu 1808 functions as a means for selecting
the access rights of the added user.

15 FIG. 19 shows a dialog box 1900 for editing one of the user's details in the list 1714. It
comprises 3 textboxes, 1902, 1904 and 1906, which allows the administrator to edit the
existing user's user ID, password and confirmation of password respectively. It also
comprises a drop down menu for editing the user's assigned access rights 1908
(administrator, supplier user or customer user) and a two buttons, the OK button 1910
20 and Cancel button 1912. The OK button exits the dialog box 1900 and applies all
changes made in the dialog box 1900. The Cancel button 1912 exits the dialog box 1900
without applying any changes. The user group drop down menu 1908 functions as a
means for editing the access rights of the user.

25 The method and system of the example embodiment can be implemented on a
computer system 2000, schematically shown in Figure 20. It may be implemented
as software, such as a computer program being executed within the computer
system 2000, and instructing the computer system 2000 to conduct the method of
the example embodiment.

30

The computer system 2000 comprises a computer module 2002, input modules such
as a keyboard 2004 and mouse 2006 and a plurality of output devices such as a
display 2008, and printer 2010.

The computer module 2002 is connected to a computer network 2012 via a suitable transceiver device 2014, to enable access to e.g. the Internet or other network systems such as Local Area Network (LAN) or Wide Area Network (WAN).

- 5 The computer module 2002 in the example includes a processor 2018, a Random Access Memory (RAM) 2020 and a Read Only Memory (ROM) 2022. The computer module 2002 also includes a number of Input/Output (I/O) interfaces, for example I/O interface 2024 to the display 2008, and I/O interface 2026 to the keyboard 2004.
- 10 The components of the computer module 2002 typically communicate via an interconnected bus 2028 and in a manner known to the person skilled in the relevant art.

- 15 The application program is typically supplied to the user of the computer system 2000 encoded on a data storage medium such as a CD-ROM or floppy disk and read utilising a corresponding data storage medium drive of a data storage device 2030. The application program is read and controlled in its execution by the processor 2008. Intermediate storage of program data maybe accomplished using RAM 2020.

20

Example embodiments of the present invention may provide the following advantages:

- No production line down
- Fast ordering due to real-time capability
- 25 - Zero Stock Inventory
- Paperless
- No need for any manual steps
- Lesser or no man power involved compared to previous systems / process flows
- Just-In-Time Delivery
- 30 - Central automatic management of several warehouse units
- Online overview of stock, supplier and customer details
- Automatic initiation of stock replenishment
- Constant monitoring of the supply cycle
- Enables purchase verification and consumption figures for individual articles

- Enables forecasting based on actual consumption
- Value of articles in stock declines

The overall effect can be a substantial cost saving.

5

It will be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive.

10

For example, in another embodiment an inventory system may be implemented in which scanner elements are integrated or incorporated with each of the bins of a bin rack holding the stock. This may facilitate faster and more convenient scanner readings.

15

Furthermore, in another embodiment, uploading of the scanned data to the supplier computer system may be automated to run at periodic or fixed intervals or done in real-time at the moment when an entry is scanned or deleted.

20

CLAIMS

1. An inventory management system comprising:
 - one or more storage structures for location at one or more customer sites;
 - 5 one or more scanner systems for location at the customer sites for scanning data associated with stock movements into and out of the respective storage structures;
 - an inventory database for maintaining inventory data based on the scanned data;
 - and
 - a computer system for location at a supplier site for issuing an alert if reorder levels
 - 10 of the respective stocks for respective customers are reached based on the scanned data stored in the inventory database.
2. The system as claimed in claim 1, wherein the computer system calculates a reorder quantity for respective stocks based on predetermined maximum stock levels
- 15 associated with the respective stocks for the respective customers.
3. The system as claimed in claim 2, wherein the reorder quantity is the difference between current levels of the respective stocks, the current levels being equal to or smaller than the respective reorder levels, and the respective maximum stock levels.
- 20
4. The system as claimed in any one of claims 1 to 3, wherein the scanner systems comprise barcode readers.
5. The system as claimed in any one of claims 1 to 4, wherein the computer system
- 25 and the scanner system are connected via the Internet.
6. The system as claimed in any one of claims 1 to 5, wherein the scanner systems are personal computer (PC) based systems.
- 30 7. The system as claimed in any one of claims 1 to 6, wherein the computer system comprises a web-based application program.

8. The system as claimed in claim 7, wherein the computer system comprises a web-based user interface.
9. The system as claimed in any one of claims 1 to 8, wherein the scanner systems
5 further comprise an interface for entering quality control data associated with the respective stocks.
10. The system as claimed in claim 9, wherein the quality control data is communicated between the scanner systems and the computer system.
- 10 11. The system as claimed in claims 9 or 10, wherein the quality control data is linked to the scanned data of the associated respective stocks and stored in the inventory database for traceability.
- 15 12. The system as claimed in any one of claims 1 to 11, wherein the storage structures comprise rack structures, each rack structure having a plurality of bins for storage of different stocks.
13. An inventory management method comprising:
20 scanning data associated with stock movements into and out of storage of respective stock at one or more customer locations;
maintaining inventory data based on the scanned data; and
issuing an alert if reorder levels of the respective stocks for respective customers are reached based on the scanned data stored in the inventory database.
- 25 14. The method as claimed in claim 13, comprising calculating a reorder quantity for respective stocks based on predetermined maximum stock levels associated with the respective stocks for the respective customers.
- 30 15. The method as claimed in claim 14, wherein the reorder quantity is calculated as the difference between current levels of the respective stocks, the current levels being equal to or smaller than the respective reorder levels, and the respective maximum stock levels.

16. The method as claimed in any one of claims 13 to 15, wherein the scanning of the data comprises utilising barcode readers.
17. The method as claimed in any one of claims 13 to 16, wherein the inventory data is
5 maintained utilising data transfer over the Internet.
18. The method as claimed in any one of claims 13 to 17, wherein the scanning of the data comprises utilising personal computer (PC) based systems.
- 10 19. The method as claimed in any one of claims 13 to 18, further comprising entering quality control data associated with the respective stocks in the inventory database.
20. The method as claimed in claims 19, wherein the quality control data is linked to the scanned data of the associated respective stocks and stored in the inventory database
15 for traceability.