AUTOPS: SERVICE-ORIENTED RFID-ENABLED REAL-TIME COLLABORATIVE MANUFACTURING PLATFORM FOR AUTOMOTIVE PART SUPPLY ALLIANCES

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ABSTRACT

Leading automotive manufacturers have been adopting RFID (Radio Frequency Identification) and ubiquitous computing technologies to alleviate their advanced manufacturing systems. RFID-enabled real-time traceability and visibility across their assembly lines help them better realizing their advanced strategies such as Just-In-Time (JIT) lean / responsive manufacturing and mass customization (MC). These initiatives create a gap between the opportunity and challenge for small and medium automotive part and accessory manufacturers (APAMs). On the one hand, these APAMs enjoy the opportunity to gain matching benefits of improved productivity, responsiveness and quality by adopting and integrating corresponding RFID-enabled advanced manufacturing technologies (AMT) with those of top-level vehicle assembly manufacturers. On the other hand, APAMs face financial and technological challenges to initiate and implement RFID-enabled AMT. This paper proposes to address this gap by developing RFID-based real-time AMT platforms (called AUTOPS) that specifically address automotive manufacturing standards and practices within APAMs. The AUTOPS solution includes three important and innovative contributions. Firstly, RFID-enabled gateways

achieve “Plug-and-Play” scalability of heterogeneous RFID and ubiquitous devices. This standard, intelligent, (re)configurable and easy-to-use gateway technology platform removes technological hurdles for APAMs to adopt/adapt RFID technologies in their daily operations. The second key contribution is a novel RFID-Gateway Product Service System platform (iGPSS). RFID gateways are taken as core products to formulate a product service system (PSS). RFID-enabled real-time services, rather than simply RFID devices, are deployed across an alliance of APAMs, instead of individual investments. The third contribution is a third-party business-to-business service-oriented architecture (SOA) platform (iAPAC) to enable collaborative decision making in dynamic partnership, and production planning and scheduling between members of APAMs alliance through sharing real-time information traceability and visibility. AUTOPS is demonstrated within a pilot scenario of an alliance of automotive electronic accessory manufacturers to show how the proposed innovative technologies are able to help APAMs as end-users to reduce the start-up investment costs, reduce the level of required specialist skills, speed up installation processes and streamline maintenance services, improve the reliability of the RFID gateway services, and stimulate the large-scale commercial applications of RFID technologies.

KEYWORDS: Automotive part and accessory manufacturers, Automotive alliances, RFID / Auto ID, Real-Time Manufacturing, Manufacturing execution system.