

Sobhi Mejjaouli

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QUALIFICATIONS:

- BS & MS in Industrial Engineering, Ph.D in Systems Engineering at the University of Arkansas at Little Rock (UALR); Major research areas: Supply Chain Engineering and Management, Manufacturing, Transportation Systems, and Applications of RFID and Sensor Networks. Dissertation Title: the Use of RFID and Sensor Networks to Optimize Enterprise Operations and Logistics.
- Design of supply chain solutions based on state-of-the-art technologies (RFID and sensor networks).
- Strong Background in Operations Research and its applications.
 - Linear programming (simplex, streamlined simplex method for the transportation and assignment problems, etc),
 - Non-linear programming (one variable and multivariable unconstrained optimization, quadratic and separable programming, convex programming using Frank Wolfe and SUMT).
 - Dynamic programming and its applications (Production and inventory control, Equipment replacement, Equipment reliability...etc),
 - Network Programming (shortest path problem and its extensions, maximum value flow problem, minimum cost flow problem...etc).
 - Metaheuristics (Simulated Annealing, Tabu search and genetic algorithms)
 - Integer programming and Mixed Integer Programming
- Proficiency in Modeling and simulation utilizing state-of-the-art computer based software tools (SysML, ARENA).
- Proficiency in using LINGO and CPLEX.
- Algorithm design and implementation using C/C++, MATLAB and CPLEX.
- Strong background in Engineering Economics and cost analysis tools.
- Notable academic achievements: as a first author, I published five conference papers, one book section and one journal paper. I have also one submitted journal paper (as first author) and another two in the final stage of preparation. I finished all the courses with a GPA 4 out of 4.
- Three years of Teaching and Student Mentoring experience.
- Active participant in Professional communities such as being a reviewer of the IEEE Systems Journal.
- Research activities such as presentations and expo artifacts at University of Arkansas at Little Rock.

- Collaboration with other Universities like University of Minnesota and Embry Riddle Aeronautical University.
- Strong communication and organizational skills

RESEARCH SYNOPSIS:

Meeting customers' demand with the minimum cost, the required quality, and within the expected timeframe is the ultimatum goal of producers and logistics companies alike. To achieve this goal, real-time supply chain systems decisions are needed to address the inherent production, operations, and market uncertainties. Machine failures impact the producers' ability to meet their scheduled demand. Logistics delays are a significant source of uncertainty, especially when perishable items are transported with direct consequences on delivery time and quality. Real-time condition monitoring for in-transit perishable items requires an adequate infrastructure system available. Two relatively new technologies for the production and logistics domain, RFID and wireless sensor networks, provide the needed sensing, processing, and data storing and communication capabilities. When integrated, the resulting monitoring and control system may allow producers and logistics companies to considerably improve their operations by gaining more visibility for the product movement across their supply chains. My work was the design and implementation of a monitoring and control system for production and transportation operations. The proposed system employs the RFID-wireless sensor networks integration and is intended to provide more flexibility for production, logistics and supply chain activities in the face of uncertainties inherent during operations. More details are given below in the list of publications, submitted work and work under preparation.

EDUCATION:

Doctor of Philosophy, Systems Engineering (4.00 out of 4.00 GPA), August 2012-December 2015,

University of Arkansas at Little Rock, Little Rock, Arkansas, USA.

Dissertation: *The use of RFID and Sensor Networks to optimize enterprise operations and logistics.*

Advisor: Dr. Ibrahim Nisanci (UALR), Co-Advisor: Dr. Radu Babiceanu (Embry-Riddle Aeronautical University).

Master and Bachelor of Science, Industrial Engineering, 2006 - 2011,

University of Tunis ElManar, National School of Engineers of Tunis.

Master's Dissertation (Under a Research Assistantship from University of Minnesota): *Supply Chain Management and Sustainability.*

Advisor: Dr. Saif Benjaafar (University of Minnesota), Dr. Atidel Hadj-Alouane (National School of Engineers of Tunis).

INDUSTRY EXPERTISE:

- Three Internships in the field of Industrial Engineering.
- Engineering Internship, Car Wiring Production and Testing.
- Engineering Internship, Supply Chain Management and Sustainability.
- Engineering Internship, Ventilation Systems production.
- One year of experience with Johnson Controls as a Manufacturing Quality Engineer, responsible of three production lines (car displays) belonging to the French car maker Peugeot-Citroen. My mission was leading four Quality Technicians in order to meet quality requirements, analyze customer returns and defects found in production, communicate with suppliers to improve parts quality, decide containment plans in case of emergencies, responsible of 3D and 8D processes and reports, prepare and maintain control plan for components and complete products, supervise effective use of SPC in production and evaluation of results, perform capability studies and process audits, support the continuous improvement of the Operator Description Sheets (ODS).

TEACHING AND MENTORING EXPERTISE:

- **University of Arkansas at Little Rock** (08/2012 - present)

Teaching Assistant

- Taught the following courses:
 - Optimization
 - Decision making and Risk Analysis,
 - Robotics Lab
 - Discrete Event Modeling and Simulation
 - Probability and Stochastic Processes
- Mentored Master's and a Bachelor's students in their Graduation projects

PROFESSIONAL SERVICE:

- Reviewer for the *IEEE Systems Journal*.

PUBLICATIONS & PROJECTS:

- Researcher in the fields of Supply Chain, Manufacturing, Transportation Systems, RFID applications in Supply Chain, System Design, System Architecture, Decision Making and Optimization.

In the following, I am including the projects I lead (1 to 11) or I made a contribution (12) with the corresponding published, submitted papers or the ones that still under preparation:

Published Work:

- 1- Sobhi Mejjaouli, Radu F. Babiceanu, "RFID-Wireless Sensor Networks Integration: Decision Models and Optimization of Logistics Systems Operation" *Journal of Manufacturing Systems* (2015), pp. 234-245

This project covers the design of a monitoring and control system to optimize logistics of perishable products. The system I am developing incorporates a Decision Making Unit that optimizes operations based on predefined objective functions that attempts to reduce costs. The main goal of this system is to cope with emergencies (like failures to maintain required transportation conditions) and make decisions (like stopping transportation and rerouting) that attempt to reduce costs. Within the framework of this system, I identified different costs pertaining to supply chain like products costs, transportation cost, inventory cost and lost sales cost. In order to investigate the potential benefits of this system, I developed many mathematical models that incorporate the different costs with the objective function of minimizing the mean cost. Since this system will be introduced in an uncertain environment, stochastic modeling based on scenario tree generation was used and the objective function will be minimizing the sum of (probability of each scenario*cost of each scenario). Mathematical models were implemented using Cplex and I was able to conduct many case studies that show cost savings.

- 2- S. Mejjaouli, R.F. Babiceanu, *Distributed intelligent real-time condition monitoring and recovery system for sustainable manufacturing enterprises*, in *Service Orientation in Holonic and Multi-agent Manufacturing and Robotics* (Borangiu, T. - Ed.), pp. 55-64, AGIR Publishing House, 2013.

Manufacturing optimization, such as production planning, job scheduling, and assignment of resources in the presence of different uncertain variables such as stochastic and diverse demand and resource unavailability (e.g., machine breakdowns) is addressed here by employing a decision making unit that uses real time data gathered by an RFID based infrastructure. Simulation Models that were developed and implemented using Arena Simulation Package show productivity increase by 2%.

- 3- S. Mejjaouli, R.F. Babiceanu, *Holonic condition monitoring and fault-recovery system for sustainable manufacturing enterprises*, in *Service Orientation in Holonic and Multi-Agent Manufacturing and Robotics, Studies in Computational Intelligence* (Borangiu, T., Trentesaux, D., Thomas, A. - Eds.), Vol. 544, pp. 31-46, Springer, 2014.

This work is complementary to the work done in 2. It integrates the distributed manufacturing concept with the new sensor network and distributed computing technologies embedded within the manufacturing system for condition monitoring and fault-recovery purposes. Through this integration, the simulated operations of the proposed manufacturing enterprise model receive more visibility, flexibility, and agility and, ultimately, provide a sustainable enterprise model able to address in real-time the uncertainties of the manufacturing environment for the products, as well as the lifecycle of the manufacturing equipment.

- 4- *S. Mejjaouli, R.F. Babiceanu, I. Nisanici, The use of RFID sensor tags for perishable products monitoring in logistics operations, Proc. of the 2014 Winter Simulation Conference (A. Tolk, S. Y. Diallo, I. O. Ryzhov, L. Yilmaz, S. Buckley, and J. A. Miller, eds.), pp. 2001-2012, Savannah, GA, Dec. 2014.*

This work introduces a system comprising a decision making tool and an RFID infrastructure that aims to face delivery disturbances because of product spoilage. This work considers a multi-echelon supply chain model composed of one producer and multiple customers and contrasts the performance of the logistics operations when this system is employed and when it is not. The simulation models of the two scenarios result in as much as nine different outcomes, which are presented in the form of good practice recommendations.

- 5- *S. Mejjaouli, R.F. Babiceanu, Integrated Monitoring and Control System for Production, Supply Chain and Logistics Operations, Proc. of the 24th International Conference on Flexible Automation and Intelligent Manufacturing (FAIM), San Antonio, TX, May 20-23, 2014.*

In this work, I proposed a framework for the design and implementation of a monitoring and control system for production and transportation operations. The proposed system employs the RFID-wireless sensor networks integration and is intended to provide more flexibility for production, logistics and supply chain activities in the face of uncertainties inherent during operations.

- 6- *S. Mejjaouli, R.F. Babiceanu, System reliability for wireless sensor networks: computational modeling and node redundancy optimization, Proc. IEEE Int'l Systems Conf., pp. 292-297, Orlando, FL, April 2013.*

In this project, I developed computational models to improve Sensor Networks reliability by Node Redundancy Optimization. I designed three algorithms with the goal of optimizing network reliability and were implemented using C++.

- 7- *S. Mejjaouli, R.F. Babiceanu, Coverage computational and simulation model for sensor network stochastic deployment, Proc. Annual Industrial and Systems Engineering Research Conference, San Juan, PR, May 2013.*

In this project, I developed four algorithms that will be used to optimize the number of nodes in a Sensor Network necessary to reach certain coverage when stochastic deployment is considered. (These algorithms were implemented using Matlab)

- 8- *S. Mejjaouli, R.F. Babiceanu, "Minimal Path Sets Models for Reliability Computation of Wireless Sensor Networks". Proc. IEEE Int'l Systems Conf., Orlando, FL, April 2016.*

The main goal of this paper is to increase the lifetime of sensor networks through node redundancy. A reliability computational model is introduced along with simulation models to investigate the effect of redundancy on lifetime.

Other Projects:

- 1- *Master Thesis: Supply Chain Management and Sustainability*

I incorporated carbon considerations (like Cap and Trade and carbon Tax) in the decisions policies (production level, inventory level..etc) by developing many models that take into account carbon considerations in supply chain operations. Each model tried to incorporate different regulations and investigate its impact on emissions and costs. These models were implemented using Cplex.

- 2 - *Redesigning the appointment system for the Arkansas Children Hospital ACH (under supervision of D. Ibrahim Nisanici)*

I was a member of a team that worked on redesigning the ACH appointment system. This team incorporated three members from the University of Arkansas at Little Rock and two members from ACH. In this project, the systems engineering approach was used starting from the problem statement and system definition to simulation of the system. Maximize system efficiency and minimize cost are two main objectives that were defined for the system by reducing the no show rate, reduce the waiting time, reduce the time between booking and appointment date and increase the number of appointment/day. Other than contributing in the design process, my main contribution was using Simulation to predict the system metrics like the wait time and the rate of processed phone calls in order to achieve maximum resource utilization and minimum cost.

EMPLOYMENT:

- Researcher in the field of RFID and Sensor Networks applications in Enterprise Operations

(University of Arkansas at Little Rock, 08/2012-12/2015)

- Teaching Assistant

(University of Arkansas at Little Rock, 08/2012-12/2015)

- Manufacturing Quality Engineer

(Johnson Controls, Tunisia, 09/2011- 07/2012)

- Research Assistant, Supply Chain Management and Sustainability.

(University of Minnesota & University of Tunis El-Manar, 01/2011-06/2011)

- Engineering Internship, Ventilation Systems

(Klimawent, Poland, 07/2010 - 09/2010)

- Farm Harvest Manager

(Al-Dakhla, Tunisia, 07/2009-09/2009// 06/2008-09/2008)

- Engineering Internship, Car Wiring Production and Testing.

(Cofat, Tunisia, 06/2009-07/2009)

AWARDS AND HONORS:

- Graduate Assistantship from the Department of Systems Engineering at the University of Arkansas at Little Rock, USA, 2012 - 2015.
- Research Assistantship from the Department of Industrial and Systems Engineering, University of Minnesota, USA, 02/2011- 05/2011.