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# **Exploration of Data Science Toolbox and Predictive Models to Improve SCM -Supply Chain Management Operations**

# **(**Manage Supply Chain processes and systems: Artificial Intelligence-AI Models to Improve SCM Operations: Reduce Thefts-Fraud, Bottlenecks-Inventory-Expiring Products -Best Pricing for Services Contracts and Goods and to Detect Issues with GPO Group Purchasing Contracts)

## **Contact Information**

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## **Statement of Interest and Experience**

### *a. Prior experience in financial supply chain applications and data science at the enterprise or health agency and individual project team member levels. (Note: we are seeking a partner firm to build the pilot AI model; we need access to a modern ERP system with thousands or millions of rows of SCM data.* ***(We prefer a PeopleSoft SCM system and a large hospital system client; we are working with the HIMSS Global Research Team on maturity models for SCM in all countries.)***

The UNLV School of Public Health, in collaboration with the Southern Methodist University (SMU) student teams seek the data science project opportunity to explore artificial intelligence (AI) and machine learning techniques. We propose to build AI predictive models for financial supply chain management (FSCM) applications and databases: to implement models to detect fraud, theft and embezzlement and improve the management of purchasing and inventory and service contracts.

Chris Papesh serves as the UNLV School of Public Health Visiting Lecturer, Healthcare Administration Undergraduate Coordinator and will volunteer his time on this AI-SCM project. Chris Papesh will be responsible to assure that project staff have the resources necessary to successfully meet the stated project objectives; assure project compliance with UNLV-SMU personnel, purchasing, and operational policies and procedures. Chris will monitor progress to identify project challenges and barriers and work to develop solutions for those which require remediation beyond the project infrastructure; and (if grant monies are awarded) monitor grant activities and expenditures to assure compliance with grant requirements. Chris Papesh has served as a Senior Manager for KPMG, the global CPA-technology firm and as a Technology Director for the Oracle/PeopleSoft global software firms. Mr. Papesh has led teams working on more than 150 enterprise software projects, such as an enterprise data warehouse and reporting systems for the US Department of Health and Human Services, and Kaiser Permanente HMO-hospitals and clinics and a series of global projects for the United Nations.

SMU will provide qualified graduate student workers (volunteers) to implement the pilot AI/Machine Learning software project and tools, with Mr. Papesh serving as the project manager and principal investigator. Mr. Papesh teaches the healthcare technology courses at UNLV and serves as a board member of the Nevada Chapter of HIMSS. <https://www.himss.org/>

Mr. Papesh has led software and reporting tool and financial supply chain application software training programs at many leading hospitals, including Grady Hospital in Atlanta and Intermountain hospitals and for the New York City public hospitals that serve 2 million residents. Mr. Papesh served as the Finance Director for the University of California, Berkeley and as an Assistant Vice President-Finance for Carnegie Mellon University leading teams and systems to manage the financial reporting on more than 5.000 research grants annually at both universities. Working for Oracle-PeopleSoft (firms merged) for over 10 years, Chris Papesh led the design and consulting teams that modified the Oracle-PeopleSoft software products and tools for use in government agencies, non-profits, higher education institutions and public health, hospital, and healthcare organizations. For example, Chris served as the senior project manager for the implementation of the PeopleSoft Financial Supply Chain applications and Projects-Research Grant system at the NYU School of Medicine and Langone Medical Center in New York City and a similar project for the Cedars-Sinai Hospital-Health System in Los Angeles, which has many research grants-projects. Mr. Papesh has contributed to published book chapters on the use of advanced software and analytics, and AI-Machine Learning in healthcare.

Our SMU-Southern Methodist University team of graduate students includes the following (all have university training in AI programming techniques and big data management); all graduate students need a Capstone Project to complete their master’s degree program in Data Analytics:

Ben Goodman

Adam Canton

Babatunde Olanipekun

## **Project/Training Plan**

### *Project goals and anticipated outcomes and benefits to the health agency and individual project team members.*

We are in the early stages of work. We are working with Anne Snowdon, a Professor from Canada who serves as the HIMSS Global Director of Research, and the SCM HIMSS International Lead managers. We had a Zoom meeting on 9/1/21. We are looking at AI models and "Maturity Models" to gage if hospitals/health systems are using advanced analytics. Anne will be sharing some of her SCM studies for the Canadian Health system. The HIMSS Global Team is working with many nations to improve their health systems-technologies. Anne presented with the HIMSS German team at HIMSS21 on the Digital Transformation of the German Health System Project (and I discussed risk models with the German Team) including more than 2,000 hospitals and thousands of clinics. <https://www.himss.org/>

We plan to work with the Oracle PeopleSoft Financial Supply Chain Management-SCM Applications which in large organizations will have millions of rows of data, including details on Requisitions, Purchase Orders, Ordering goods, Goods Received, Date-time stamps or fields, and detailed Accounts Payable voucher and payment histories on all checks (or EFT payments) or payments made to vendors (and detailed invoices from vendors). Database tables will include if transportation or freight costs and dates.

We plan to build the following AI Predictive Models to better manage Supply Chain Management-SCM processes and systems: Artificial Intelligence-AI Models to Improve SCM Operations; Reduce Thefts-Fraud-Embezzlement, Predictive Models for Bottlenecks-Inventory-Expiring Products; Determine Best Pricing for Services Contracts and Goods and to Detect Issues with GPO Group Purchasing Contracts.

Our SMU team has training in AI tools, including Python and R-tools: we will select the appropriate AI tools as we design and build the software and predictive models.

Our UNLV-SMU Team will perform a literature review to determine the best AI models to manage SCM operations based upon published professional journals, peer reviewed articles and other professional sources on the design and development of AI models to address key supply chain operational issues.

Our literature and data review with include FBI data on embezzlement and fraud patterns by insiders and external agents and hackers. The client firm/ hospital may assign a contact manager(s) from their Internal Audit Division or External CPA-Audit firm to serve as stakeholders as we build the AI Theft-Fraud detection models, to advise the team on their audit priorities.

Our project milestones and deliverables are as follows:

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1. By February 28, 2022, complete exploration of artificial intelligence (AI) and machine learning techniques to extract SCM data and train the AI models
2. By April 1, 2022, develop a how-to guide documenting methodologies and results from the exploratory analysis in outcome 2) above.
3. By June 1, 2022, draft a Power Point slide deck summarizing the project methodology, findings, and lessons learned, to be to the client organization’s project governing board to review the results of the project, meeting in either June or July or August 2022.
4. By June 30, 2022, evaluate the potential to adapt software and reporting tools, to a production ready system. Develop a project plan to design, build and test the production ready AI SCM models.

### *Detailed work plan describing the tasks involved in completing the goals and deliverables described above, along with a timeline.*

The literature review will begin in September 2021. We will seek a partner firm or hospital system who will grant access to a development database copy of their production Financial Supply Chain Management (FSCM) applications to design and build the AI predictive analytics models against their rows of data. We hope to have an agreement to access the Development Database by 10/15/2021: our UNLV-SMU team will sign non-disclosure and business associates’ agreements, if needed.

The UNLV-SCM team will begin work on the project design-build-train-test tasks before November 1, 2021. We will need remote access to the Development Database instance: ideally a dedicated PeopleSoft FSCM database with VP1 (full access) security access.

The UNLV-SMU team plans to use the open-source Python and “R” software for the core AI-machine learning tasks and other open-source programming languages and tools for artificial intelligence (AI) and machine learning applications: all software and tools deployed will have the condition that the software is open source and can be obtained by the client free of charge.

Chris Papesh will serve as the project manager and he will meet with the SMU team every week to discuss technical issues, review progress on methodology development, and prepare presentations to stakeholders. They will also collaborate on the development of the how-to guide. The UNLV-SMU team will be responsible for drafting the guide. Our proposed project timeline is presented in Table 1.

**Table 1 Project Deliverables and Timeline**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year/Month**  **Project Deliverables** | **2021** | | **2022** | | | | | | | |
| **11** | **12** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| **UNLV-SMU Team Activities** | | | | | | | | | | |
| Sign-off on the Project goals, scope, schedule, and objectives with SMU; and client staff (firm that owns the SCM databases) | x |  |  |  |  |  |  |  |  |  |
| Explore artificial intelligence (AI) and machine learning techniques to extract data and develop the initial models |  | x | x | x |  |  |  |  |  |  |
| Develop a how-to guide documenting methodologies and results. |  |  |  |  | x | x |  |  |  |  |
| Attend bi-weekly meetings with SMU staff. |  | x | x | x | x | x | x | x |  |  |
| Draft weekly progress reports; hold project status meetings |  | x |  | x |  | x |  |  |  |  |
| Draft the final project summary report outlining the epidemiology methods, challenges/limitations, and key next steps |  |  |  |  |  |  | x | x |  |  |
| Prepare Power Point slides for presentations |  |  |  |  |  |  |  | x | x | x |
| **SMU Activities** | | | | | | | | | | |
| Participate in the kickoff call with the client Finance-SCM & IT team | x |  |  |  |  |  |  |  |  |  |
| Participate in the selection process of key staff to assist the UNLV-SMU team | x |  |  |  |  |  |  |  |  |  |
| Form a local SCM Advisory Committee that include stakeholders from the client organization and HIMSS, if a health organization | x | x |  |  |  |  |  |  |  |  |
| Host quarterly SCM-AI Models Committee meetings. |  |  |  |  | x |  |  | x |  |  |
| Host bi-weekly meetings for contract management and technical discussion. | x | x | x | x | x | x | x | x | x | x |
| Review and approve the how-to guide drafted by the UNLV-SMU team |  |  |  |  |  | x |  |  |  |  |
| Review and finalize the progress reports and final report and send them to the client team |  | x |  | x |  | x |  | x |  |  |
| Review and finalize the Power Point slides prepared by the UNLV-SMU team, and present at an client meeting or call in July or August 2022. |  |  |  |  |  |  |  |  | x | x |

## **Budget and Justification**

### *a. Budget*

We request a total budget of $0.

The UNLV-SMU team members will volunteer their time but retain all intellectual property rights to all software developed. All intellectual property rights will be retained by the two universities, UNLV and SMU, and the UNLV-SMU team members who contribute to the project tasks and management of the scope, deliverables, and testing of the software tools.

If a client firm provides access to a SCM application-development/ testing database: the client firm will be granted a license to use the pilot software for $0 per year fee for 30 years.

As stated previously, the UNLV Team will collaborate with SMU to complete all project deliverables. UNLV PI Chris Papesh will provide project management, including guiding meetings with client staff and other stakeholders, and review and approval of the bi-monthly or monthly progress reports (with client managers-stakeholders) and final report drafted by UNLV-SMU team; we estimate that Chris Papesh will spend approximately 0.17 academic months (about 50 hours) on project management activities. SMU will provide qualified graduate student workers to implement the pilot AI/Machine Learning software project and tools and prepare reports, slides, and presentation materials,

Project Assumptions

1. The partner firm or hospital system will provide a dedicated Development-2 copy of the FSCM applications-database and sufficient IT technical support to allow remote security access to the Development-2 database to allow building of the AI models.
2. The UNLV-SMU Team will meet with client stakeholders monthly to report progress and issues. The client will provide a technical contact manager to assist in resolving technical or access issues if they arise between monthly meetings.