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Explaining and Predicting Abnormal Expenses at Large Scale using Knowledge Graph based Reasoning

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Abstract

Global business travel spend topped record-breaking $1.2 Trillion USD in 2015, and will reach $1.6 Trillion by 2020 according to the Global Business Travel Association, the world s premier business travel and meetings trade organization. Existing expenses systems are designed for reporting expenses, their type and amount over pre-defined views such as time period, service or employee group. However such systems do not aim at systematically detecting abnormal expenses, and more importantly explaining their causes. Therefore deriving any actionable insight for optimising spending and saving from their analysis is time-consuming, cumbersome and often impossible. Towards this challenge we present AIFS, a system designed for expenses business owner and auditors. Our system is manipulating and combining semantic web and machine learning technologies for (i) identifying, (ii) explaining and (iii) predicting abnormal expenses claim by employees of large organisations. Our prototype of semantics-aware employee expenses analytics and reasoning, experimented with 191, 346 unique Accenture employees in 2015, has demonstrated scalability and accuracy for the tasks of explaining and predicting abnormal expenses.

Keywords: Semantic web; Reasoning system; Intelligent system; Smart expenses; Intelligent Operation System; Knowledge graph

1. Introduction

Time and expense is the term used by the finance department of most large organisations to capture the "*process of recording and tracking hours worked and expenses as they relate to projects*". $546 Billion worldwide has been estimated to be lost in 2015 because of the lack of spend optimisation in the process of managing expenses at organisation level [1].

Such non optimization is characterized by (i) absence of context capture, which strongly restricts the interpretation of high-value expenses, (ii) rudimentary approaches to catch any level of employees frauds, which result in over $1 billion lost each year to fraudulent expense reimbursement[1], (iii) ad-hoc auditing of employee s expenses, which results in unflagged abnormal spending, (iv) rigid and static expenses policy which does not fit all expenses and limits it efficiency to well-know expense types, (v) inappropriate tools for expensing and capturing causes of abnormal expenses. All limitations are due to the manual design of predefined rules and policies for patterns that are supposed to command all expenses data.

AIFS[2,3] (**A**rtificial **I**ntelligence **F**inance **S**ystem), as a system which integrates exogenous data from hetero-

[1] https://www.accountingtoday.com/opinion/expense-report-fraud-will-cost-companies-1-billion

[2] Video (.mp4 format) available: https://goo.gl/K8UcI2

[3] Live system: http://54.194.213.178:8111/ExplanatoryReasoning/demo.jsp