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Expert Knowledge Elicitations in a Procurement Card Context:

Towards Continuous Monitoring and Assurance

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AGENDA

- **INTRODUCTION**
- **THE DATA**
- **P-CARD MISUSE DETECTION**
- **MOVING FORWARD**
- **CONCLUSION**

INTRODUCTION

- Why P-card has higher fraud risk than employee credit card?
  - P-card owners have a higher number of transactions on a normal basis, while employee credit card usage is typically linked to event or a business trip.
  - For P-card transactions, no pre-approval is required, while normally employee credit card transactions need to be approved by the manager before AMEX gets reimbursed.
  - Values involved are higher due to type of goods/services purchased, which drives pressure to commit fraud.
  - Difficulty to detect misuse increases opportunity, which, together with the pressure, constitute two out of three fraud triangle factors.

INTRODUCTION

- P&G's team currently analyzes pro card data for misuse manually, hence the desire to design a system that would automate the process

- Main objective:
  - The elicitation of an expert's knowledge by conducting unstructured interviews and ultimately build an expert system to detect p-card misuse

THE DATA

- The data file obtained details every transaction from the preceding month of employee p-card use, and averages about 50,000 transactions with 51 attributes

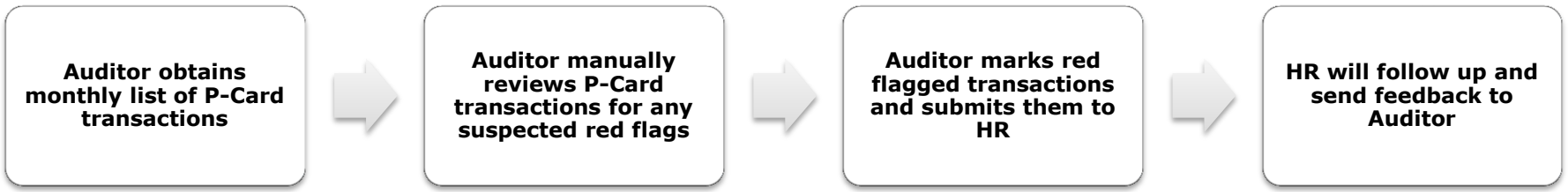
- Data obtained is monthly 2013 data starting from April till July

- Some of the data fields have missing values

P-CARD MISUSE DETECTION - Analysis

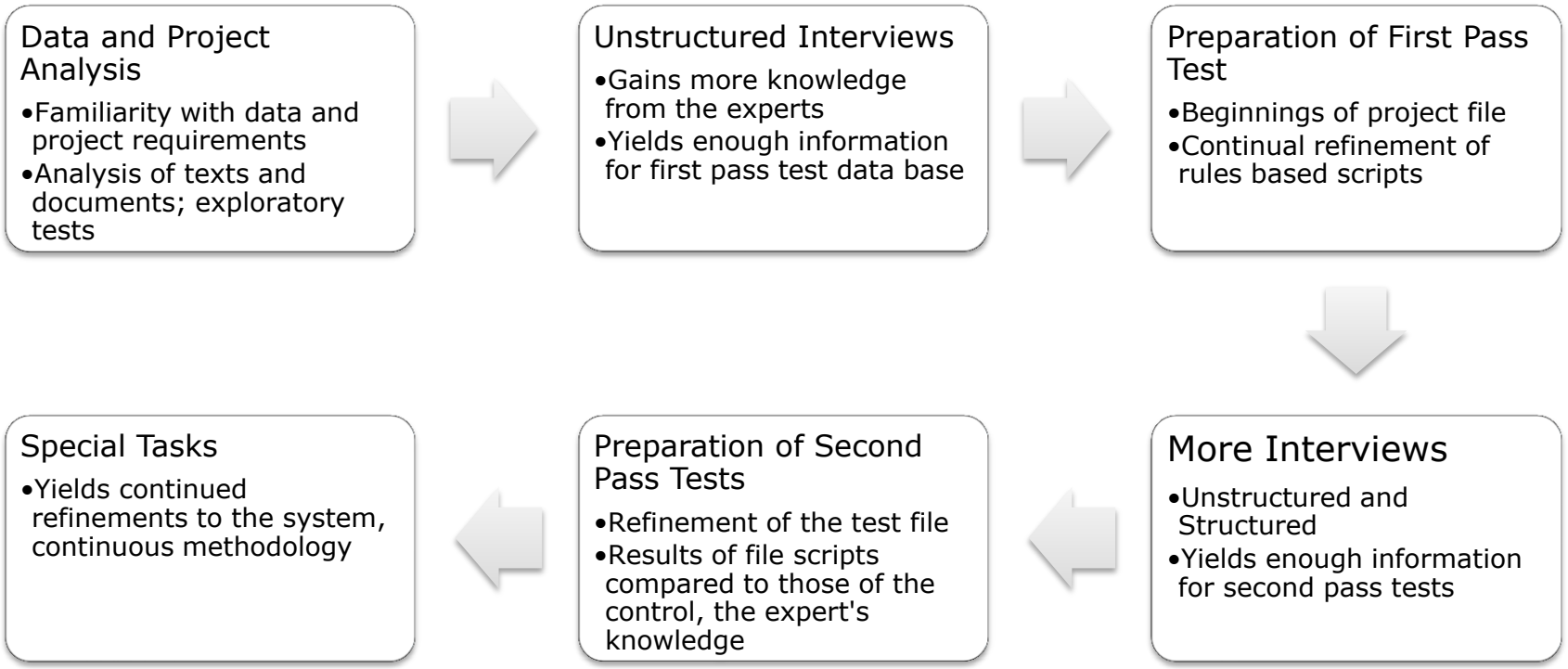
- Firm's Procurement Process

- Auditor's Monitoring Process



P-CARD MISUSE DETECTION - Analysis

- The project requires elicitation of an expert's knowledge



P-CARD MISUSE DETECTION - Results

- First test was textual analytics. By having certain keywords marked as inappropriate, we were able to filter those out.

ID	Purchase Date	Original Currency Amount	Extended Item Amount	Merchant Name	Item Description
ID1637	2/17/2011	0	50	STAPLES 00101907	$ 50 APPLES ITUNES
ID1917	2/22/2012	0	7.59	TARGET 00014472	POKER CHIPS 11.5G GAME ESSEN
ID0925	3/25/2011	84.95	75	AMAZON MKTPLACE PMTS	ITUNES GIFT CARD
ID4720	7/22/2011	0	10	BOLDEN INSTRUMENT	FUEL CHARGE $10
ID2503	10/6/2011	31.95	31.95	AMAZON MKTPLACE PMTS	PROACTIV SOLUTION ORIGINAL REPAIRIN
ID0305	10/11/2011	16.28	12.99	AMAZON.COM	CONAIR TOUCH AND TONE MASSAGER WITH
ID2315	10/11/2012	49.69	41.66	STAPLES	STRESS BUSTER MASSAGE FOOT
ID5477	11/14/2012	24.5	22	AMAZON MKTPLACE PMTS	BRIDAL WEDDING JEWELRY HAIR HEADBAN

- One case (highlighted in red) identified immediately as fraudulent by the company

P-CARD MISUSE DETECTION - Results

- One of the main challenges of this project was of designing an expert knowledge system where a key data field, such as purchased item description, is missing

ID	City	Original Currency Amount	Merchant Name	Item Description	Product Code	Purchase Date
ID0484	ORLANDO	2,367.68	WM SUPERCENTER			
ID2934	CINCINNATI	2,472.93	WM SUPERCENTER			
ID0918	CINCINNATI	2,231.71	WM SUPERCENTER			
ID0918	CINCINNATI	2,393.84	WM SUPERCENTER			
ID0918	CINCINNATI	2,450.16	WM SUPERCENTER			
ID0918	CINCINNATI	2,454.88	WM SUPERCENTER			
ID0918	CINCINNATI	2,499.41	WM SUPERCENTER			
ID3264	WEST CHESTER	2,417.45	WM SUPERCENTER#3502			
ID0918	CINCINNATI	2,320.69	WM SUPERCENTER			
ID4347	JACKSON	2,459.78	WALMART.COM			
ID4347	JACKSON	2,384.48	WALMART.COM			
ID1547	RUSSELLVILLE	2,200	WAL-MART			
ID1547	RUSSELLVILLE	2,500	WM SUPERCENTER			
	TOTAL	31,153.01				

- For example, a major vendor opts to not provide any item description information.
  - Management needs to put more consideration in such cases were the opportunity to commit fraud is more apparent

P-CARD MISUSE DETECTION - Results

- Examples of some rules used:

IF *[MCH_Merchant_Category_Code]* ***EQUAL*** *4900*

AND *[MCH_Merchant_Name] NOT EQUAL "Waste Management"* ***OR*** *"Suburban Propane"*

AND *[Department_Cost_Center]* ***OR*** *[Department_Name]* ***CONTAINS*** *"PLANT"* ***OR*** *"Manufacturing"* ***OR*** *"BUILDINGS/GROUNDS"*

THEN ***FAIL***

IF *[MCH_Merchant_Category_Code]* ***EQUAL*** *(RANGE:7829-7999)*

AND *[Department_Name]* ***NOT EQUAL*** *"NATIONAL GOVERNMENT RELATIONS"*

AND *[MCH_Merchant_Name]* ***NOT EQUAL*** *"CAPITOL HILL CLUB"*

THEN ***FAIL***

P-CARD MISUSE DETECTION - Results

- Over the last few months the system detected three fraudulent cases during the testing phases alone

- The initial first run of the expert system produce a total of 1408 exceptions

- After reviewing the exceptions with the experts, 68% were considered legitimate red flags and would require further investigation

MOVING FORWARD

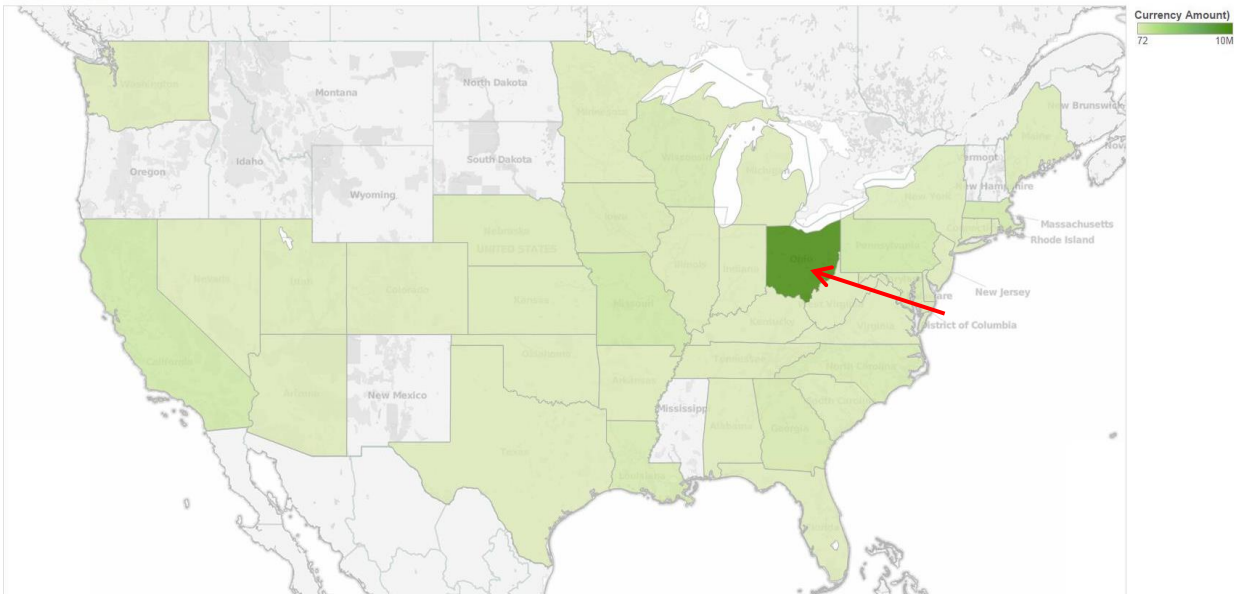
- Further refine rules with the experts, and run the system on new data

- Building user purchase behaviors by applying pattern recognition and utilizing visualization scenarios to assist in outlier detection.

- Higher risk factors will be assigned to:
  - Certain predefined types of pattern changes.
  - Differences in individual purchase patterns vs. the cluster aggregate.

MOVING FORWARD

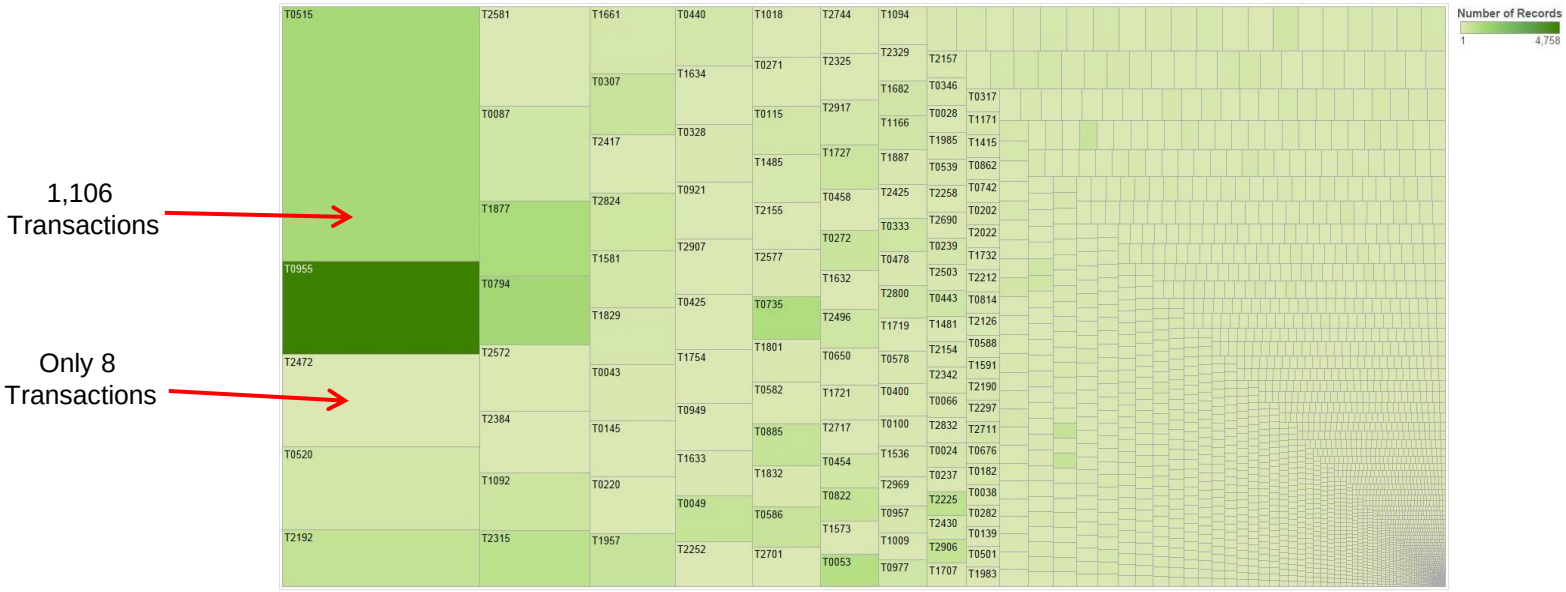
- Examples of some visualization scenarios we created to help in building user purchase behaviors:



- The most heat (color) intensity among the states goes to Ohio, i.e. it has 64% of the total dollar amounts spent.

MOVING FORWARD

- By aggregating dollar amounts per transaction for both merchants and employees, we can further understand the data and be able to build better purchase patterns



- One example here is employee T2472, were despite being third place in terms of total dollar spending ($424,879), has only 8 records in total

CONCLUSION

- The project is still a work in process, primarily due to the complexity of rules and transactions that must be gleaned in this outlier detection process

- Furthermore, these tests can be applied on a continual basis, contributing to the continual journey of expert knowledge elicitation in a continuous auditing and monitoring environment

- Moving forward we plan on applying different analytics for misuse detection such as building user purchase behaviors