KGC 2021 Workshop on Knowledge-Infused Learning

Using Contact, Content, and Context in Knowledge-Infused Learning: A Case Study of Non-Sequential Sales Processes in Sales Engagement Graphs

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Knowledge-Infused Learning (K-IL)

Symbolic representation of domain knowledge (KG)
- Deep Infusion
- Semi-Deep Infusion
- Shallow Infusion

Stratified representation of knowledge representing different levels of abstractions

Current use-cases & applications
- Understanding online media on crisis response
- Social network analysis for mental health insights
- Autonomous driving for scene detections
- Healthcare domain

Contents are the dominant data source
- Medical & health documents
- Sensor data
- Texts
- Images

The knowledge about the communication and buying preference of the buyers and who needs to be talked to.

The metadata and information of the past activities, emails, deal status & qualified leads’ attributes.

Example: The subject and body of inbound emails provide information about buyers intent & relevant content for different sales activities.

The engagement history, time-bounded deal-closing constraints and buyers pain points.

Our proposal: Incorporate not just contents, but also contacts and contexts in the K-IL approach.

Sales Engagement Domain

All 3Cs are temporal and dynamic in nature
Non-Sequential Sales Processes & Challenges

Multi-Activity

(a) Sequential Process with Sales Stages
- Discovery → Demo → Assist → Propose → Commit

(b) Non-Sequential Process with Sales Activities
- Discovery → Demo → Assist → Propose → Commit

Multi-Actor

Seller
- Sales Development Representative (SDR),
  Customer Success Engineer,
  Technical Solution Architect,
  Account Executive (AE)

Buyer
- Lead or contact or prospect,
  Project champion,
  Decision makers,
  Budget holder

Challenges
1. Finding the right contacts to start or resume or accelerate a sale process
2. The lack of proper usage and understanding of content generated from both buyers and sellers
3. The insufficient context while transitioning and onboarding new accounts or closing a deal
Sales Engagement Platforms (SEPs)

A new category of software

SEP encodes & automates sales activities (sending emails, scheduling calls, meetings, etc) into workflows
Enables sales reps to perform one-on-one personalized outreach up to 10x

Limitations

- System of activities can happen at all sales stages. Intents of email during discovery and commit are different.
- Measuring the progress of active opportunities and forecasting a deal outcome based solely on engagement activity and sales performance metrics have become less effective

Opportunity

Need to go beyond gleaning the surface measures and look deeper into domain modeling (i.e.: 3Cs with KGs) and associated processes
The Vision: Sales Engagement Graph Framework

Challenge: Contact, Content, and Context (3Cs) require proper modeling and data mining to derive actionable insights

Our Contributions

1. Methodology Development
   - A three-phase Sales Engagement Graph (SEG) framework for non-sequential sales processes

2. Application Area
   - Discuss the role of 3Cs in all three phases with challenges and solutions proposed
   - Present initial implementation of Phase 1 & design for Phase 2 and Phase 3
Data, Pipeline & Goals

Data: Emails, Meetings transcripts & notes, Engagement logs (email received & sent)

Three-phase Sales Engagement Graph (SEG)

Capture & unfold the underlying sales patterns, 3Cs & relationships between the types of sales activities to derive new insights

Support timely predictions and actionable recommendations for a given sales scenario

End goal: To have the right context, use the best content and qualified contacts to achieve better guided engagement between buyers & sellers to get a positive engagement outcome (meeting booked, deal closed etc.)
Phase One: Knowledge Capture and Representation

**KNOWLEDGE CAPTURE**
1. Determine use-cases
2. Scoping & documentation

**MULTI-SOURCE DATA INGESTION & INTEGRATION**
3. Extract & integrate data (emails, engagement logs) while maintaining explicit provenance (with annotations of the data origin, creation time, and time of capture)

**CONFLATION**
4. Run entity disambiguation

**Primary Research Question:** Can we capture the underlying actors involved in the sales process to surface the who-knows-who (Contact) information?

1. Who are the people in my organization has prior engagements with the buyer
2. Who are all the connected contacts for a given buyer

The **AGILE (Pay-as-you-go)** Methodology to build the SEG

Real-world person entity can have aliases, & abbreviations. Unsupervised generative bayesian classifier with Expectation Maximization (EM).
Phase One: Knowledge Capture and Representation

A preliminary version of the SEG ontology modeled around the relationship between the actors and activities in a sales process.

Instantiated with people’s information harvested from the engagement logs & existing SEP’s information such as prospect’s contact info.

Evaluation:
The pilot SEG derived from extracting over 4.7M engagement logs events (emails sent and received).

Harvested 64K newly discovered person entities (20% increase in terms of number of people) - translate to a better coverage of all relevant people involved in the process.

Conflation accuracy achieved 83% in terms of F1 score.
Phase Two: Knowledge Discovery and Mining (Design)

**Primary Research Question:** Can we unfold the dynamics between the types of sales activities within the time-bounded SEG?

**Goal One: Discovery and Validation of Non Sequential Sales Processes** by Multi-label Subgraph Classification: Labeling of higher-order semantics to temporal SEG interconnected 3Cs: meeting data, sender, recipients info, email signature, email intent

**Objective:** Surface series of action paths to allow decision makers to analyze the sales activities that are often revisited & reshape sales objectives

**Goal Two: Establish a Probabilistic Markov Sales Activities Model:** Model the relationships between the types of sales activities

**Sales Activities View**

**Sales Process View**

**Markov Sales Activities Model**

**Multi-label Sales Activities**

**Demographics**

<table>
<thead>
<tr>
<th>Actor</th>
<th>Micro-actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Image of Actors and Micro-actions]</td>
<td>[Image of Weighted Edges]</td>
</tr>
</tbody>
</table>

**Time (t)**

- $t = 0$
- $t = 1$
- $t = 2$
- $t = 3$
Phase Three: Knowledge-Infused Assistance (Design)

Goal One: Finding the Best Action Path.
Objective: Calculate impact & predict the outcome for an action path based on weighted transition probabilities of each sales activity.

Goal Two: Recommending Turn-by-Turn Micro-Actions. Break the best action path down into series of micro-actions (e.g., sending emails, setup meetings, etc).
Objective: Recommend turn-by-turn actions that produce the highest conversion rate.

Primary Research Question: Can we recommend the next best action to maximize a deal's closing rate?
Sales Reps: What should I do next to push for a positive engagement outcome or close the deal?

**Phase 1:** SEG captures the who-knows-who (Contact) information

**Phase 2:** With the Markov Sales Activities Model, we know the best action path(s) for this particular prospect based on historical dealings (how to proceed) (Content & Context)

**Phase 3:** Knowledge-Infused Assistance (3Cs)

**Contact:** Based on prior engagements, we know what is the communication preference (e.g., meeting call) and the best time to initiate the contact (e.g., morning hours)

**Content:** What materials, template, pricing, and incentives to use

**Context:** What was discussed and at which sales activities

The next best action is to **schedule a meeting call between 8 and 10 in the morning with the VP of sales** and **present a product demo**.
Conclusion

- The current COVID and post-COVID era have seen a shift in the sales practice of modern B2B (e.g., transitioning towards online-based): need to re-evaluate their strategic positions and offerings to the public.

- **Application:** While existing SEPs increase the overall productivity of sales reps, continuously providing “intelligence” needed for the users is the next evolutionary goal for SEPs.

- **Methodology:** The non-linear sales process provides a driving use case for us to envision a three-phase SEG framework that goes beyond incorporating not just content, but also contacts and contexts in the K-IL approach.

- We believe it is the step towards (a) a more holistic K-IL and (b) disrupting the next-era of the sales engagement and ultimately the customer engagement industry.

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