A Service-Centric Social Network Analysis for Turf Badger's Stevens Point Office

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DS745: Visualizations

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Introduction

Turf Badger is an S corporation based in Wisconsin that focuses on lawn care, mosquito, and pest control customer services. To date, the company operates ten offices across four states in the US. At the end of 2022, they opened an additional office in Stevens Point, Wisconsin, whose sales data from January 2024 to October 2024 serve as the source for this report. Ultimately, anonymization and an investigation of customer networks by subscription services was performed utilizing R software with the goals of gaining insights into how the branch could build stronger customer communities for future business growth (Vegesna, 2020).

Anonymization & Cleaning

To ensure customer anonymity, highly sensitive information on customers was removed from the dataset used in this analysis. For personal identification purposes, a unique “Customer ID” column was used. While the branch’s sales go back as far as 2022, only customer sales in 2024 were utilized. Notedly, only those customers who were still actively subscribed were utilized from the data. Both of these decisions were done to capture the most relevant information regarding current customer networks of the branch. Collectively, there were 937 customers in the final data. For each customer, information on their sales representative, broad subscription type, narrow service type, and city were also available. The final variables and data are attached in this report's `2024_Active_Customers.csv` file.

Social Network Analysis

Social network analysis can allow businesses to understand the functional components of their customer base, such as influencers, connectivity, and vulnerabilities to name a few (Great Learning, 2024). These graphs incorporate nodes and edges to show connections

between individuals. Companies can utilize information from network analysis for furthering connectivity that helps increase customer retention via a community-like structure. Here three social networks for Turf Badger's Stevens Point office are analyzed to provide recommendations for developing their customer community.

Subscription Social Networks

Overall, three networks were created for identifying the spread of customers across business subscriptions. The first works with the overarching lawn, mosquito, and pest service types to identify the broader connectivity of customers (Figure 1). The next two utilize the highly segmented subscriptions for each service type to identify how subscriptions are leading to the broader connectivity from the first network (Figure 2). Ultimately, unique networks for customers with one or more and more than one subscription active were made for the segmented subscriptions. Each network was considered directed since customers are directed towards their service type subscriptions. Only service or subscription nodes were labeled to avoid overcrowding. Several metrics were used to investigate the networks, which included network density, PageRank centrality, and community detection.

Figure 1: Turf Badger's Stevens Point Network of Active Customers by Service Type in 2024

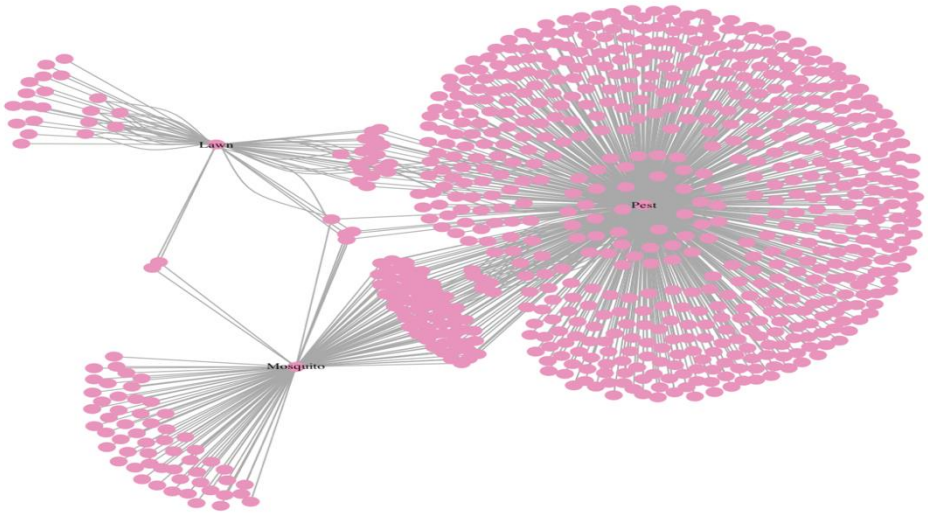
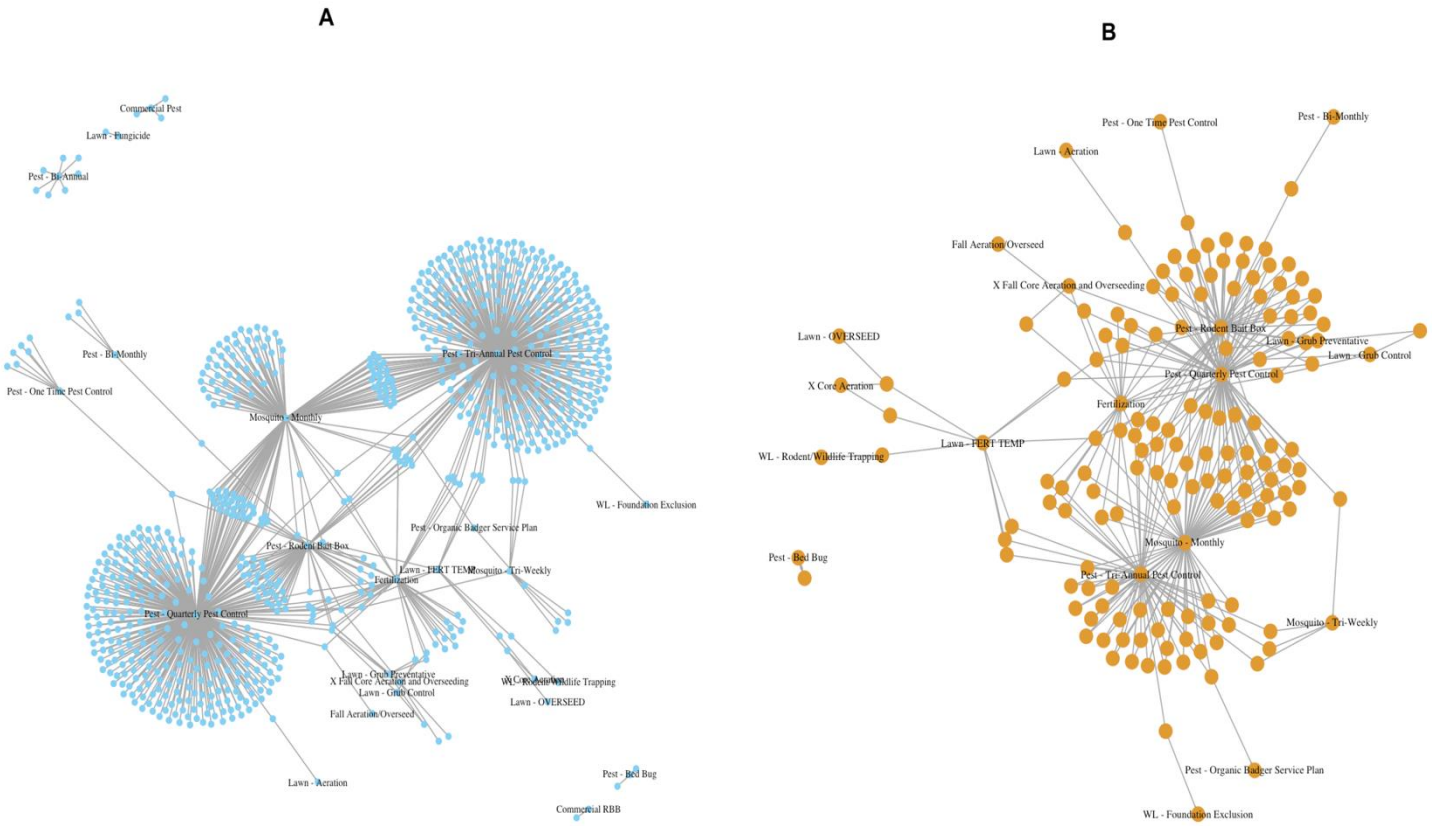


Figure 2: Turf Badger's Stevens Point Network of Active Customers With One or More (A) and More Than One (B) Subscription in 2024



Network density is a representation of the number of edges found in a network and the maximum possible edges that can be found within the network (Aibin & Datta, 2024). In these networks, the density scores range from zero to one and represent how connected the customers are to the range plausible subscription services. Since customers are not connected to each other, we suspect network density to be low. However, the higher the value, the more service subscriptions customers are connected too.

Overall, the network densities were 0.31%, 0.30%, and 2.44% for the overarching services, one or more subscription, and more than one subscription networks respectively.

Collectively, these findings indicate that customers are generally not branching out into multiple services and their subscription types unless they have more than one subscription.

In social networks, centrality refers to measures of the importance of a particular node to the network. In directed social networks, a centrality measure known as PageRank is typically used for scoring node importance. PageRank works best for these types of networks because it scores based on back-linking, which is based on how many edges are directly connected back to a node. By utilizing PageRank scores, depicted by node size in the figures below, the importance of the three service types and the top five ranked subscriptions for the networks were identified (Figure 3 & 4).

Figure 3: Turf Badger's Stevens Point Network of Active Customers by PageRanked Service Type in 2024

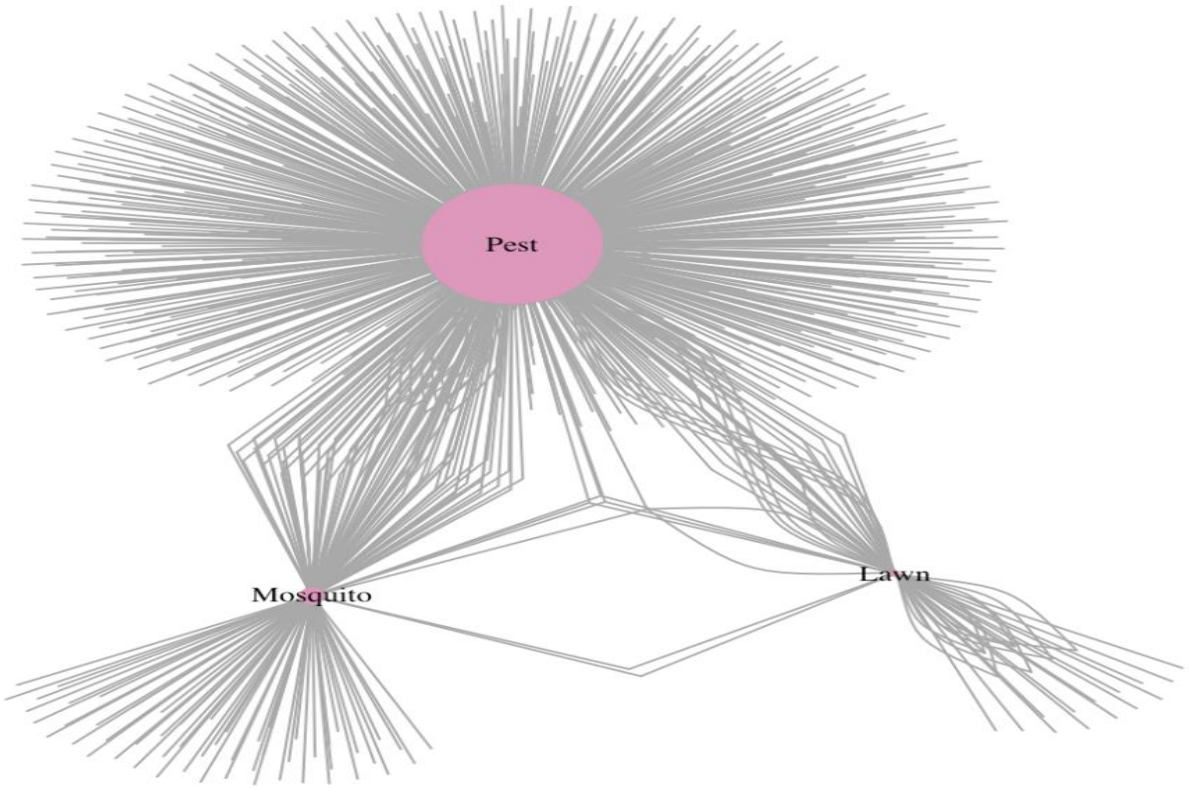
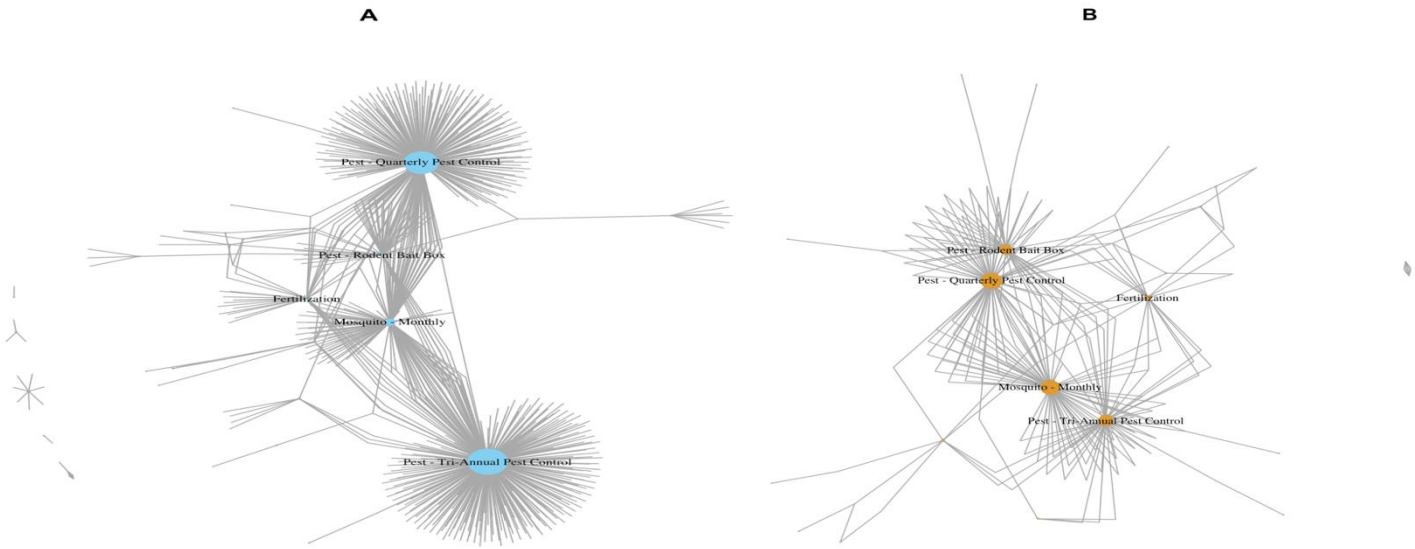
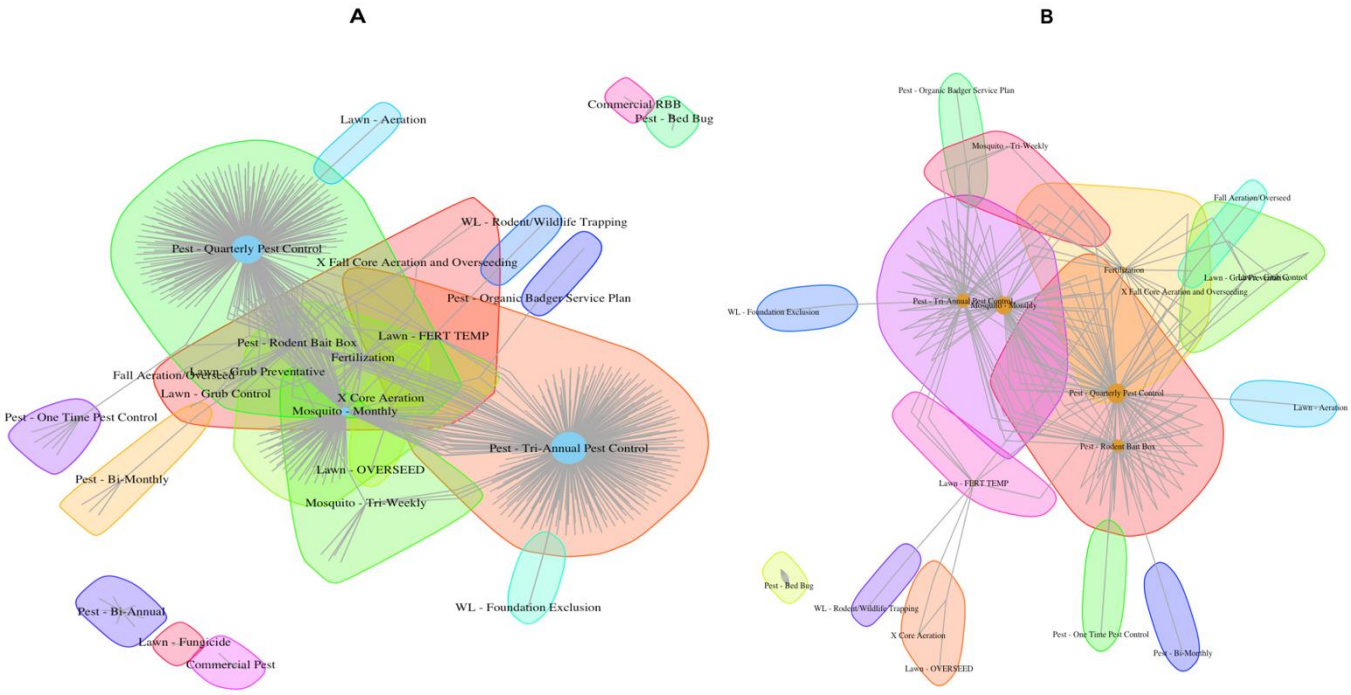


Figure 4: Turf Badger's Stevens Point Network of Active Customers With One or More (A) or More Than One (B) Service Subscriptions in 2024 With Only the Top Five PageRank Scored Nodes Labeled



Lastly, WalkTrap community detection algorithms were fit to the networks for one or more and more than one subscription for identifying densely connected customer groups (Mao et al., 2017). This algorithm utilizes random walks to score distances between nodes and create community clusters (Figure 5). By identifying which subscriptions makeup particular clusters, recommendations for ideal customer communities could be made. Additionally, vulnerable customer communities could be identified in this way.

Figure 5: Turf Badger's Stevens Point Subscription Type Communitity Networks for Customers With One or More (A) and More Than One (B) Active Subscriptions in 2024



Findings & Recommendations

Initially, it is clear that the majority of customers are connected through the pest-based service type. We also see that more customers subscribe to all three service than to both lawn and mosquito services concurrently. Ultimately, the most important subscriptions for the customer base according to PageRank are tri-annual, quarterly, and rodent bait box pest services, monthly mosquito services, and fertilization lawn services. Based on these findings, it seems pest subscriptions serve as the backbone of the active customer service network. Therefore, the company should prioritize connecting customers to pest-based services, perhaps through cross selling or running free trial promotions, to increase the likelihood of retention and build a stronger customer community.

As for the structure of these communities, the strongest network of customers can be reached by following the guidelines for connecting other lawn and mosquito customers to pest services by following the WalkTrap groupings. For customers with one or more subscription, those subscribed to lawn services other than fertilization should be offered this subscription. Additionally, mosquito monthly plans should be prioritized for offering to those with mosquito services. This is because fertilization and monthly mosquito subscriptions serve as a likely bridge to the central community connecting rodent bait box pest subscription (Figure 5 A, shown in red & green). From here, the customers have a greater likelihood of being connected to the quarterly or tri-annual pest services, which would firmly lock them into the network.

Alternatively, for customers who have more than one subscription, mosquito service subscribers should be directly offered tri-annual pest subscriptions for building a stronger community (Figure 5 B, shown in purple), while those with a lawn fertilization subscription fertilization (Figure 5 B, shown in yellow) should be offered quarterly pest control or rodent bait box pest subscriptions. Ultimately, across both networks, customers subscribed to bi-annual, one-time, bi-annual, organic badger, foundation exclusion, bed bug, and commercial pest services appear most vulnerable for attrition as they have very little to no community overlaps with the core PageRank subscription services. This is also true for fungicide and aeration lawn subscription services.

In full, this analysis serves as a basis for defining a strategy for creating the strongest customer community network for Turf Badger's Stevens Point office. However, connecting customers based on subscription services should be supplemented with further connection opportunities to fully reach the high customer retention goal. For instance, while this report is a

service-centric social network analysis, the branch should could further provide an online forum or meeting place where customers can interact with each other and customer service representatives to form more personable connections. This additional customer-centric social network would strengthen the customer communities further, and should be considered a priority future work.

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