## **ACKNOWLEDMENT**

First and foremost, I would like to express my deepest gratitude to my supervisor, Mr. Nungki Selviandro, S.Kom., M.Kom., Ph.D., for invaluable guidance, patience, and continuous encouragement throughout the preparation of this thesis. The expertise and insights have been essential in shaping the direction and quality of this research.

I also extend my sincere thanks to the Head of the Master of Informatics Program, Dr. Setyorini, S.T., M.T., for the support and for fostering an academic environment that encourages research excellence.

My appreciation goes as well to all the faculty members of the Master of Informatics Program, whose teaching and mentorship have enriched my knowledge and inspired me to pursue this work with diligence.

I am profoundly grateful to my beloved family—my parents, Mr. Syawal and Mrs. Yolan, and my entire extended family—for the unconditional love, prayers, and endless support throughout this journey.

Finally, I would like to thank Raafi Zakariya and all my dear friends for their understanding, encouragement, and companionship that have helped me persevere through every challenge. The presence has made this academic journey a truly meaningful and memorable experience.