Introducing a Mobile Health Care Platform in an Underserved Rural Population: Reducing Assimilations Gaps on Adoption and Use via Nudges

Joseph Hodges
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Introducing a Mobile Healthcare Platform in an Underserved Rural Population: Reducing Assimilations Gaps on Adoption and Use via Nudges

by

Joseph Hodges

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctorate of Business Administration Muma College of Business University of South Florida

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Keywords: Mobile applications, Assimilation gaps, Design Science Research (DSR), Elaborated Action Design Research (EADR), Multi-level assimilation gaps, Consumer platforms

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Dedication

This work is dedicated to my father, Cheatham, who completed his course work for his Ph.D., but was unable to finish his dissertation as he decided the support of his eight children came first; to my mother, Joan, for always inspiring a great work ethic along with the value of education; my spouse, Steve, for caring for our child and keeping the home fires burning; and my beautiful son, Finnegan, who I hope will do great and amazing things with the highest sense of adventure. For those who find value in my research, my wish is for your greatest success as you create inspiring solutions to the challenges our world faces.
Acknowledgments

To that young man who had a 1.42 grade point average in high school, thank you for always believing that no matter how hard things got you would always fight to complete any challenge you faced no matter how hard the path became. Your optimism has never led me astray.

Thank you to my committee members who made me work harder, dig deeper, and reach further. As I am a believer in the saying “that which does not kill us makes us stronger,” you challenged me to go the extra mile and learn the value of deeper exploration. Matthew Mullarkey, thank you for your insight into assimilation gaps. This really pulled my research together and allowed me to explore some unchartered territories. Alan Hevner, I am grateful for your patience as you edited and re-edited of my work. It took me some time, but, eventually, your lessons sank in. I will carry them forward. Thank you, Wendy Jennings, for your amazing edits and your late work into the night to help me meet deadlines.

Thank you to the DBA cohort of 2019, especially Danielle Clark, Gen Dobson, Charles Hilterbrand, Carla Dorsey, Pete Kirtland, and Mike Donahue. The countless hours of study and fun created an amazing balance that stabilized us to the completion of this challenging work. It’s my honor to call you friends and, more importantly, fellow doctors.
Big cheers to Grandon T. Gill! Your eternal optimism and faith in our success always gives us a strong push to explore our capacity and to carry this degree forward to accomplish great things. I am grateful that you and Matt Mullarkey had the vision to create this program.

Finally, a big dose of appreciation to Marion T. Young, USF Associate Vice President of Development. My family may never forgive you for mailing me the flyer to apply for the DBA program, but I am deeply honored that you believe in me the way you do. You have never steered me wrong in your guidance. For that, you forever have my trust.
# Table of Contents

List of Tables........................................................................................................................................ iii

List of Figures ........................................................................................................................................ iv

Abstract ................................................................................................................................................ v

Chapter 1. Introduction and Background..........................................................................................1

1.1 Motivation........................................................................................................................................2

1.2 Research Questions and Units of Analysis ..................................................................................6

1.3 Hypothesis.......................................................................................................................................7

Chapter 2. IT Implementation .............................................................................................................8

2.1 Artifact Development Cycle and History ..................................................................................8

2.2 The Initial Development of the CareValet Platform ...............................................................11

Diagnosis: Validating the Platform Development ......................................................................11

Value Perception .........................................................................................................................20

Build Trust ......................................................................................................................................21

Search Usability ............................................................................................................................22

Platform Design ............................................................................................................................22

Chapter 3. Literature Review ...........................................................................................................24

3.1 Healthcare Crisis .....................................................................................................................25

3.2 Rural Health Crisis ..................................................................................................................27

3.3 Consumer Healthcare Priorities .............................................................................................28

3.4 Platform Design .......................................................................................................................29

3.5 Adoption Theory ......................................................................................................................31

3.6 Use ...........................................................................................................................................34

3.7 Nudge Theory ..........................................................................................................................35

3.8 Assimilation Gaps ......................................................................................................................38

Chapter 4. Research Methods..........................................................................................................40

4.1 Design Science ..........................................................................................................................40

4.2 Elaborated Action Design Research .......................................................................................40

Diagnose ..........................................................................................................................................42

Design ...............................................................................................................................................42

Implementation ...............................................................................................................................42

Evolve ...............................................................................................................................................42

4.3 Adoption in the EADR Cycle ....................................................................................................44

4.4 Use in the EADR Cycle ..............................................................................................................45

Chapter 5. Adoption..........................................................................................................................47
8.2 Research Practice .......................................................................................................104
  Healthcare Consumers .............................................................................................105
8.3 Contributions to Practice .........................................................................................106
  Platform Developers ..................................................................................................106
  Policy Makers .........................................................................................................107
8.4 Research ....................................................................................................................109
  RQ1 – How Adoptable is the CareValet Platform in a Rural Population? ............109
  RQ2 – What Strategies Most Promoted the Adoption of a Consumer Healthcare Platform in This Microcosm of the Population? .............109
  RQ3 – What Strategies Might Best Support Use Improvement in a Digital Healthcare Platform in a Rural Community? .....................110
8.5 Limitations ...............................................................................................................112
8.6 Future Research .........................................................................................................113
References ...................................................................................................................116
Appendix ......................................................................................................................119
List of Tables

Table 1: Customer Activity Measurement ................................................................. 15
Table 2: Measuring Assumptions vs. Customer Responses. ...................................... 16
Table 3: Establishing an MVP for UI/UX. .................................................................. 16
Table 4: Activity Design vs. Customer Action Metrics ............................................... 17
Table 5: Elaborated ADR Entry Points ....................................................................... 44
Table 6: Problem-Centered Design Cycle .................................................................. 51
Table 7: Adoption Design Cycle 1 ............................................................................. 55
Table 8: Adoption Design Cycle 2 ............................................................................. 57
Table 9: Adoption Design Cycle 3 ............................................................................. 58
Table 10: Adoption Design Cycle 4 .......................................................................... 61
Table 11: Problem-Centered Design Cycle Model for Nudge Development ............. 75
Table 12: Nudge Design Cycle 1 ................................................................................ 79
Table 13: Nudge Design Cycle 2 ................................................................................ 80
Table 14: Nudge Design Cycle 3 ................................................................................ 81
Table 15: Nudge Design Cycle 4 ................................................................................ 83
List of Figures

Figure 1: Average Annual Worker and Employer Premiums ......................................................... 2
Figure 2: Current Challenges in Healthcare .................................................................................... 4
Figure 3: Consumer Priorities in Healthcare Survey ................................................................. 9
Figure 4: Innovation Spectrum ..................................................................................................... 12
Figure 5: Market Segmentation .................................................................................................... 13
Figure 6: Customer Segment ....................................................................................................... 14
Figure 7: Customer State .............................................................................................................. 14
Figure 8: UX Findings .................................................................................................................. 19
Figure 9: Value Perception ........................................................................................................... 20
Figure 10: Building Trust ............................................................................................................ 21
Figure 11: Search Usability ......................................................................................................... 21
Figure 12: Platform Design Steps ............................................................................................... 22
Figure 13: American Technology Use ........................................................................................ 25
Figure 14: Four Core Consumer Priorities .................................................................................. 28
Figure 15: Network Effects Loop ............................................................................................... 30
Figure 16: Digital Nudge Design Method ................................................................................... 37
Figure 17: The Four ADR Stages ............................................................................................... 41
Figure 18: The ADR Process Model with Research Entry Points ............................................... 43
Figure 19: The Mobile Health Platform Development Cycle and Adoption Process ............... 45
Figure 20: The Mobile Health Platform Development Cycle and Use Process ...................... 46
Figure 21: Adoption Design Cycle Strategy ................................................................. 50

Figure 22: CareValet App Sample .............................................................................. 53

Figure 23: SGCG Enrollment Flyer .......................................................................... 54

Figure 24: January Adoption Levels ........................................................................ 57

Figure 25: February Adoption Levels ..................................................................... 60

Figure 26: January-September Adoption Levels ................................................... 62

Figure 27: Adoption Assimilation Gap ................................................................... 64

Figure 28: Use Design Cycles ................................................................................ 71

Figure 29: Digital Nudge Examples ....................................................................... 82

Figure 30: Digital Nudge Use Results ................................................................... 84

Figure 31: Use Events ............................................................................................ 88

Figure 32: Artifact Assimilation Gap ..................................................................... 91

Figure 33: ROI vs. Costs ....................................................................................... 92

Figure 34: Multi-level Assimilation Gap ................................................................. 115
Abstract

Rural communities are often overlooked when it comes to offering cutting edge consumer healthcare technologies. Mobile applications usually exclude populations in rural demographics due to the infrastructure requirements and available technology in the region. The population studied is a low income rural health plan in southwest Georgia. They are uniquely considered as they have the highest healthcare costs in the U.S. and are compared to healthcare costs among higher income populations like Vail, Colorado. Innovations, such as mobile healthcare applications, have the capacity to offset some of these costs, but even if adoption occurs, this does not guarantee use will naturally follow. This study explores the creation and development of a mobile healthcare application (i.e., the platform) and measurement of the assimilation gap in the use of the adopted platform. The platform was designed to simplify the access to use opportunities between consumers and providers of care with the long-term goal of reducing healthcare costs. The use opportunities measured in this platform are telemedicine visits and electronic appointment setting.

This research presents a process for influencing assimilation gaps in healthcare platforms. Measurement techniques for successful healthcare platform programs are constrained due to data limitations. Building on existing assimilation gap research and designing artifacts that include nudging techniques, this study identifies concepts that display assimilation gap narrowing methods that improve healthcare platform design. Using elaborated action design research (EADR), each artifact design cycle follows a process map to improve adoption and use. The research discovers how adoptable a healthcare platform (CareValet) is within a rural population,
which strategies most promote adoption, and what strategies might best support use improvement. In this study, platform adoption is compared as the relative value against each use metric for key stakeholders including consumers (e.g., health plan members), clients (e.g., employer or health plan), and platform developers. Research contributions include the development of assimilation gap narrowing methods and return on investment (ROI) value graphing tools associated with platform use.
Chapter 1. Introduction and Background

In order to help define the challenges of obtaining healthcare in a rural area and to introduce the innovative solutions being measured in this dissertation, it is important to establish a clear background regarding the current state of healthcare and the population being observed. According to the Kaiser Family Foundation 2018 Healthcare Benefits Study (KFF), “The average annual premiums for employer-sponsored health insurance in 2018 are $6,896 for single coverage and $19,616 for family coverage [Figure 1].” These costs are shared between the employer and the employee. This study found the average single premium increased 3% and the average family premium increased 5% over the past year. These increases have remained steady over the last several decades. Over the last decade, while premium increases have slowed, the cost of care is still outpacing inflation, which increased at 2.5%, according to the study.

This imbalance in the cost of care has an overall negative effect on wage earners, particularly employees in small businesses (i.e., defined as businesses with 1-199 employees). A business with a large share of low wage earners (e.g., rural areas) can have as many as 35% of their employees earning less than $25,000 a year (KFF, 2018). Using simple math, it’s easy to conclude that if a low wage earning employee has selected healthcare coverage, they are contributing 4% as a single person toward their health plan leaving them with $23,814 and 22% for family coverage toward their health plan leaving them with $19,453 of their pre-tax income before FICA, Medicare, and state taxes or other benefit contributions are removed. These financial facts, in addition to the employee’s responsibility for paying a deductible averaging
$1,573 should they actually use their health plan, is the reason many low wage earners end up in medical collections or even medical debt.

Figure 1. Average Annual Worker and Employer Premiums

1.1 Motivation

As demonstrated in the 2018 Kaiser Family Foundation Study, rural communities are deeply affected by healthcare costs, specifically the southwestern region of Georgia. Employers in this and surrounding communities are affected not only by rising healthcare costs, but also by a lack of care options. Two hospitals control most of the access to care. There are no urgent care services available and all emergency and urgent care needs are addressed in a hospital setting. This further drives up the cost of care and is a major contributor to medical debt in an already
poor population. These concerns were initially presented by Nelson (2016) in his journal contribution titled, “The Two Georgias: Disparities in Rural Health and Healthcare.” In 2016, the Kaiser Family Foundation and Washington Post revealed that this area of southwest rural Georgia was one of the most expensive areas for healthcare in the U.S. (Rau, 2014). Their fees were on par with Vail, Colorado, one of the most affluent areas in the U.S.

Solutions to the rising cost of healthcare are greatly needed to help curb the disparity in access to cost efficient quality care. Mobile devices have provided consumers a platform for solutions to many of their daily needs. Some of these tools have provided exponential shifts in costs and access to many goods and services. The most meaningful platforms have shifted market behavior away from traditional services to digital solutions. Large scale platforms, like Amazon and Uber, are often used as examples. But emerging platforms, like Shipt and Instacart, (e.g., grocery shopping platform), GrubHub (e.g., food delivery service), and BidPal (e.g., auction bidding app) are examples of tools that have been adopted by consumers to simplify access and, perhaps, reduce costs.

Consumer directed mobile platform development in the healthcare industry is in its infancy. Mobile healthcare platforms are theorized to decrease medical spending and improve care choices by offering lower cost options to their prescribed users. Healthcare platforms have historically focused on creating operational efficiencies. Little focus has been placed into the development of mobile healthcare platforms directed toward the consumer that are “adoptable” and produce valued outcomes for all of the stakeholders. Measuring adoption and use in this research allows us to quantify these values as the CareValet team introduces their platform to the stakeholders (employees) of a South Georgia county government (SGCG) health plan. The SGCG health plan is located specifically in the region identified in the Kaiser study (KFF, 2018).
To understand the value proposition offered by the start-up CareValet, it is important to recognize the goals and strategies embedded in the mobile platform. These strategies are specifically designed to more easily connect consumers and providers of care. The end result is to simplify healthcare access and to promote financial sustainability to all stakeholders by engaging them in preventative healthcare strategies.

CareValet is a mobile healthcare platform that is designed to reduce the cost of care by creating a “guided consumer experience.” This experience is intended to mitigate medical spending through the provision of lower cost options when the member needs certain types of services (e.g., if a member needs urgent or emergency services, they are guided toward a telemedicine provider who can typically handle 70% of these types of situations according to Teledoc, a national telemedicine vendor). Other strategies included in the CareValet application mitigate appointment setting challenges (e.g., one of three patients have problems seeing their doctor in a timely manner) by allowing the user to schedule appointments on the application (see Figure 2).

This image has been removed due to copyright concerns

Figure 2. Current Challenges in Healthcare
Observing the adoption and use as the CareValet platform is made available to the SGCG stakeholders will identify whether this platform is achieving these goals. The secondary goals and observations for the purposes of this dissertation are to reduce medical spending and to improve overall health plan outcomes. According to the CareValet team, the platform is designed to be flexible. Customizations, if needed, can be integrated through design iterations to achieve the goals of each stakeholder.

Currently, some of the greatest costs to a health plan occur when consumers make an uneducated guess regarding how to initiate care services when they have a medical need. The decision to seek emergency room care, urgent care, and diagnostic services can have a devastating cost impact on the consumer and the health plan when lower cost services could be a viable alternative to resolve their care needs. Effective guided consumer experiences, such as mobile health platforms, can reduce costs to the health plan and the member when they are steered in the direction of cost efficient services.

This research will follow the CareValet Development Team as they introduce their mobile platform design. This exploration will include an analysis regarding how and whether the development of the platform CareValet is adoptable by the SGCG stakeholders. It will also document the events and actions taken by the team to improve overall adoption and usage. A detailed analysis will be provided following the design cycle of the CareValet platform, especially as the team addresses their adoption and use goals. According to the CareValet team, a successful level of adoption by SGCG stakeholders will provide them with options in their health plan that promote a level of clinical and financial control that minimizes cost exposure and leaves them with a successful guided consumer experience.
1.2 Research Questions and Units of Analysis

This research follows an elaborated action design research cycle and is employed to methodically diagnose, design, implement and evaluate the process adopted by the CareValet development and implementation teams. Documenting these iterations by the development team will identify whether the strategic goals of adoption and use defined by the CareValet Development Team are met. Stakeholder value will also be evaluated in the process. While the goal of the CareValet team is to identify the adoption and use of the SGCG stakeholders, the research goal is to provide valuable knowledge to the broader research community regarding the theories that best support the adoption and use process as these stakeholders engage new healthcare mobile app technologies in the consumer healthcare market. Also, an additional research goal is to provide value and information to developers working in the healthcare consumer market. The following research questions were established to evaluate the CareValet Development Team goals:

RQ1) How adoptable is the CareValet platform in a rural population?

RQ2) Which strategies most promoted the adoption of a consumer healthcare platform in this microcosm of the population?

RQ3) What strategy might best support use improvement in a digital healthcare platform in a rural community?
The goal of this dissertation is to determine whether the platform is: 1) adoptable, 2) adds value to the marketplace and its stakeholders, 3) reveals the specific adoption and use value elements (i.e., theories) that is determined to best effect the primary stakeholder, and 4) identifies valuable outcomes that using EADR cycle.

1.3 Hypotheses

With the identification of these stakeholders, our research developed these hypotheses as potential outcomes to the study.

**H1 based on RQ1)** It is theorized, using the EADR cycle, that the CareValet mobile health platform will achieve adoption levels above the national average of 7%.

**H2 based on RQ2)** Programming and process decisions made through the EADR cycle will improve enrollment volume.

**H3 based on RQ3)**

1) Telemedicine Calls: The researcher theorizes the CareValet Development Team will improve use by injecting nudge theory in the development of the platform.

2) Appointment scheduling: The researcher theorizes the CareValet Development Team will improve use by injecting nudge theory in the development of the platform.
Chapter 2. IT Implementation

2.1 Artifact Development Cycle and History

The CareValet platform was conceptualized in 2015 to improve the flow of information and access between consumers and medical providers. Historically, consumers are only allotted access to providers designated by the terms and available tools of their health plan. According to the Consumer Priorities in Healthcare Survey (Deloitte, 2016), this pattern of communication is not socially or financially sustainable. The present level of access does not address the key needs of importance to the consumer and, in particular, their access to providers and transparency about pricing and quality information. For example, pricing transparency reflects the consumer’s knowledge or access to actual allowed charges for a particular treatment or service or comparison information regarding provider charges compared to other medical providers who offer the same services. Quality information would provide data identifying the number of successful procedures a surgeon has performed or infection rates within a particular hospital. With this type of information and with the goal of enhancing the consumer’s experience and solving the transparency gap, CareValet seeks to provide consumers with a guided consumer experience by simplifying digital access to medical providers within the parameters consumers have identified that had value to them.

The CareValet mobile application and web platform connects consumers and medical providers by simplifying digital access. The value of present day digital access has been defined by the Consumer Priorities in Healthcare Survey (Deloitte, 2016) as one of the four priority
categories of healthcare consumers. The results of this survey placed digital access at the lowest level of the four ranking categories primarily because digital tools are not intuitive to consumers’ needs and digital tools have not inspired consumers to access providers differently. The goal of the platform is to replace a very time consuming healthcare experience with a digital user interface that allows for immediate access between the consumer and the provider thereby enhancing their access to care. The CareValet platform is presently offered to the consumer through employer health plans as an employee portal for all their healthcare needs.

In conceptualizing the platform, the CareValet Development Team referenced consumer stakeholder value within the platform by referring to key points in the Consumer Priorities in Healthcare Survey (Deloitte, 2016). The survey consisted of 64 data points that identified four common themes that were most valued by the consumers surveyed (see Figure 3).

The results: Consumers want to be heard, understood, and given clear directions through a personalized health care experience.

Figure 3. Consumer Priorities in Healthcare Survey
According the study, consumer preferences resulted in four important themes when asked about their desired healthcare experience. They are as follows:

- Priority One: Personalization expected via providers.
- Priority Two: Economically rational coverage and care choices.
- Priority Three: Convenience-driven use of care.
- Priority Four: Digitally connected to manage healthcare.

While a digital connection to healthcare seemed to rank lowest within the Deloitte (2016) study, it noted that there is a lack of present connectedness with digital tools in healthcare when compared to other industries. The findings in the study encouraged continued development in this area with the following recommendations:

- (Re)evaluate (don’t reduce) digital spending to create integrated and seamless digital experiences. Plans and other players need to assess whether and how their digital tools are being utilized and which digital tools actually matter for each member segment.
- Focus digital investments on the healthcare interactions that matter most to consumers: provider experience and affordability. By focusing on what’s most important to consumers, plans can drive better and broader digital adoption and earn the permission space to digitally engage consumers for other reasons (e.g., scheduling, health monitoring, and web chat).
- Leverage digital tools to better support the provider-payer-member engagement model. Emphasize to providers what digital tools and data from the plan they have at their disposal to be more efficient, more personal with members,
and help them to better manage costs, improve outcomes, and make the payment and reimbursement experience more seamless.

- Use digital to improve members’ experiences to promote better affordability, cost transparency, and network affirmation. This is consistent with what consumers ranked most highly in this survey.
- Update experience and quality measures to track what really matters to consumers. Track the use of digital tools to see what works and compare change over time relative to the provider considerations discussed earlier. When, and if, success is observed and measured, market thoroughly to prospective and existing consumers to build awareness.

In late 2016, after the Deloitte (2016) study was released, the CareValet Development Team took these findings into account as they upgraded each version of the platform.

2.2 The Initial Development of the CareValet Platform

When the CareValet team began the journey of developing a “consumer-driven” platform, they followed lean methodologies. The team took the concept of the platform and began a process of evaluation to determine the value of the platform.

**Diagnosis: Validating the platform development.** The lean methodology approach employed by the CareValet team followed guideline principles recommended in the literature. In the assessment stage of the platform application development, the CareValet team carefully addressed the strengths, weakness, opportunities, and constraints of the proposed platform. To ensure the best approach in moving forward, the CareValet team began the process of review
offered through the *Lean Entrepreneur* workbook (Cooper & Vlaskovits, 2013) in order to effectively diagnose and define next steps.

The Workbook (Cooper & Vlaskovits, 2013) required the team to perform an eight-step analysis to guide the CareValet team through a lean design process that brought to the surface the viability of the product and market readiness. The eight steps are as follows.

- The Innovation Spectrum – Determining whether CareValet was an innovative product or a traditional pipeline business model.

![Innovation Spectrum](image)

**Figure 4. Innovation Spectrum**

The innovation spectrum assists in determining whether the business model is traditional vs. a model where there is no or limited business processes in place. A sustainable innovation would be a product or service presented to a well-defined and existing market. Examples could include introducing a new car or a new shade of lipstick to a population that has already come to like and use these products. These customers indicate what they like about these products or services. In contrast, a disruptive innovation is a new product or service that does not yet have a defined market or is a product or service that has never been previously introduced like a new
technology. Customers can’t add value because they are unfamiliar with the innovation and can only speculate as to what the value might mean to them.

- Market Segmentation – Identifying the market segments that are most interested or have so much pain in the current environment that they are ready for change.

![Figure 5. Market Segmentation](image)

Market segmentation allows innovators to define populations that have a need for change within a particular segment or related to a specific product or service. These consumers share a particular trait that allows businesses to target these groups because they are substantial, identifiable, measurable, accessible, and responsive. Specifically, where do they hang out, who influences them, what pain or passion do they share, and the impact of addressing the pain or passion.

- Customer Value Stream – Determining how the customer is moving when exposed to the innovation. Are they moving from aware, to intrigued, trusting, convinced, hopeful, satisfied, and passionate?
Customer segmentation allows for the evaluation of a product or service based upon how the prospective customer responds when presented with the product or service. This evaluation process allows for a quantitative analysis based upon whether the customer is intrigued, convinced, trusting, hopeful, satisfied, passionate, and/or aware of what is being presented.

- **Customer Development** – Conduct interviews with customers to determine where they fall in the value stream by creating hypotheses and then evaluating them against customer response.
The customer state within a development cycle allows a business to determine how their customers will respond to their proposed innovations. It is based on the range of responses from employing consumer segmentation. For instance, by employing a quantitative analysis, it is determined that the customer is passionate about the innovation. It may be because it provides them value. As such, their behavior may result in them re-subscribing to the product or referring to it to others. In providing referrals to the product and the company, the company could offer a referral incentive that influences the customer state.

- Experimentation – Measuring what customers do vs. what they say they will do.

Table 1. Customer Activity Measurement

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Experiment</th>
<th>Hypothesis</th>
<th>Customer Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person exists/details correct</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer has problems/interest/passion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer will respond to solution [high level]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer will become passionate when she is impacted in this way</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer will be satisfied with specific functionality r, if r</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer will make final decision to buy when</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer will trust the company when</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer will trust the product when</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer will want to learn</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Experimenting with consumers and documenting their activity on a consumer activity measurement table provides feedback to the Development Team as they gather a broader range of details related to how consumers are responding to the product details.
- Data - Based upon assumption, metric hypothesis, and actual results.

Table 2. Measuring Assumptions vs. Customer Responses

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Metric</th>
<th>Hypothesis</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer will be satisfied with specific functionality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer will become passionate when</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer will make final decision to buy when:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer will trust the company when:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer will trust the product when:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Defining the assumption and customer responses, a development team is able to determine how the consumer behaved when presented with the value proposition. These responses create the basis for creating a minimum viable product (MVP).

- Minimum Viable Product (MVP) Build – Defining the product UI/UX (user experience) based upon feedback.

Table 3. Establishing a MVP for UI/UX

<table>
<thead>
<tr>
<th>Segment</th>
<th>Specific Functionality</th>
<th>Hopeful</th>
<th>User Suggestion</th>
<th>User Passion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Segment2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Based upon each segment, understanding what the consumer responded to most and how they responded can lead to stronger development in meeting their needs.

- Funnel vision or result measurements – Measuring each segment of the build to determine where the customer fell on the value stream.

Table 4. Activity Design vs. Customer Action Metrics

<table>
<thead>
<tr>
<th>Funnel State: Hopeful</th>
<th>Activity</th>
<th>Customer Action</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hopeful Example</td>
<td>Follow-up thank you get started guide, free customer support e-mail drip campaign</td>
<td>Customer tries these specific things:</td>
<td>Activation by cohort, by segment</td>
</tr>
<tr>
<td>Activity 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity 4</td>
<td></td>
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<thead>
<tr>
<th>Funnel State: Satisfied</th>
<th>Activity</th>
<th>Customer Action</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfied Example</td>
<td>Feature x</td>
<td>Customer uses feature x, y, z 4x/week</td>
<td>Engagement by cohort by segment</td>
</tr>
<tr>
<td>Activity 1</td>
<td></td>
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</tbody>
</table>

Based upon each UX design in the MVP and under each market segment, this table allows the development team to quantify consumer reactions and actions to the various segment activities in an MVP.

In order of importance, the lean process informed the CareValet team what the shareholders were most interested in when it came to development of the platform:

Consumers

Employee/Consumer – Wants ease of access, communication with providers, the ability to evaluate costs and/or quality, and is at the front end of all healthcare decisions.
Clients:
Health Plan/Employer – Wants clear ROI, specifically a reduction in the utilization of high cost services (e.g., ER use, urgent care, and diagnostic services). Wants to see employee/member adoption and use of the app.

Broker/Consultant – Wants similar results to the Health Plan/Employer and an overall reduction in healthcare costs and improved employee health.

Producers:
Healthcare Providers – Wants a valid and eligible patient, needs easy access to health plan coverage details, simplicity of payment, and easy appointment scheduling.

By the end of April 2017 and based upon both internal and external analysis resulting from the eight step analysis, the CareValet team further determined there was market readiness for the use of a mobile health platform and began its formulation to identify the best approach to design a beta version of the platform. After review of the diagnosis information, the CareValet team determined the best approach would be to contract an independent third party development and user experience (UX) design firm to establish a pilot study to evaluate market viability.

From several firms evaluated, CareValet selected a mobile development company called NearSoft to establish an MVP (Minimum Viable Product) user experience and test the results with a pilot study. NearSoft was chosen because of their healthcare market experience (i.e., they
built several apps for known entities in our market space) and their creative ability. This NearSoft team was the team that built the Open Table application.

A kickoff canvas was presented by NearSoft in May 2017 that defined the scope of the project. The project goal was threefold: 1) make CareValet more intuitive, 2) validate user workflow, and 3) fix usability issues to improve current UI. The project was proposed to take place within nine weeks beginning in June 2017 and defined the following timeframe outcome goals:

- Weeks 1-3: Research - run usability testing and interpret feedback.
- Weeks 4-5: Validation - test the prototype and improve workflow.
- Weeks 6-8: Improve UI - design standards and high fidelity mocks.
- Week 9: Assets - create a style guide and build iOS/Android applications.

The CareValet leadership team approved the project scope and NearSoft initiated the project.

NearSoft presented the MVP mobile app design to the pilot group and received feedback regarding the usability and usefulness of the app. The resulting data became the roadmap for NearSoft to develop the design standards and style guide.

**Agenda UX Findings**

1. Value perception
2. Building Trust
3. Usability
4. Brainstorming Solutions
5. Next steps

Figure 8. UX Findings
The results of the study provided findings that illustrated value perception, trust, usability, solutions, and the next steps as indicated in Figure 8.

![Figure 9. Value Perception](image)

**Value Perception.** The resulting consumer surveys produced invaluable data. Under value perception, consumers continually indicated the need to find in-network physicians within the app (see Figure 9). This was identified by the NearSoft team as being the most valuable feature. Consumers expressed their desire to use mobile and web services differently. Under mobile, consumers felt they would be most likely to search urgent care facilities. For web services, appointment setting was the most desired activity.
**Build Trust.** Consumers were a bit reluctant to build trust with the application initially as they expressed a desire to contact their doctors directly for appointments over using an app (See Figure 10). Their reluctance was due to the fact that an appointment time was not immediately available in the app. They also stated they would be hesitant to use telemedicine primarily because it is unfamiliar to them. However, they indicated that they would call the telemedicine physician if their doctor was unavailable.
**Search Usability.** Consumers expressed how tasks in a digital platform could be easier to perform (see Figure 11). They indicated they don’t know which treatment or procedure they need, but they do know what symptoms they are having. This demonstrated that consumers were looking for a way to get connected to a provider who could best address their care needs by sharing how they felt. Geo location was also a priority. Consumers wanted the system to show them where they are on a map and then to have the providers they needed populate around them. They also didn’t want too many options to populate around them. It was important for them to see who was around them and then see a list of those providers as an option as well.

![Next Steps:](image)

*Figure 12. Platform Design Steps*

After this segment of the consumer interviews was complete, the NearSoft team moved to the next stage of the project to address the design of the platform.

**Platform Design.** The next step in the process addressed platform design illustrated in Figure 12. Taking the pilot group’s recommendations into account, the NearSoft team designed a wire-frame that was used to reformat the app design. This resulted in the development of the design standards and style guide. These documents were the guiding influence submitted to the CareValet development team for programming and development.
The design standards focused the results of the NearSoft study and guided the CareValet Development Team to build both the mobile and web applications that feature elements most desired by the subjects in the pilot study. The CareValet platform was implemented anticipating it would achieve the outcome goals of the platform. Those outcomes focused around ensuring the platform was “adoptable” and promoted “intuitive consumer use” through “choice architecture” (Thaler & Sunstein, 2009, 2013).

To evaluate whether the goals were achieved, the CareValet Development Team needed to release its beta version to consumers. In order to evaluate and measure whether the goals of the platform were achievable, the CareValet Development Team piloted the release with a group that had significant challenges when it came to access of care and cost inefficiencies in their region. These access and cost inefficiencies are two areas the platform hoped to improve in health plans, as well as to provide solutions to challenges in healthcare defined in the Deloitte (2016) study. The pilot group selected a South Georgia County government health plan. The plan is made up of 151 employees and has a total of 264 eligible lives that include dependents. This group is located in the specific area in South Georgia where Kaiser Health News and the Washington Post documented some of the highest healthcare costs in the U.S. While the CareValet platform has lofty goals to impact healthcare costs and solve access barriers in health plans, this research focuses on the value of the platform in its early stages. Thus, this implementation would measure whether the design standards of the CareValet Platform were adoptable and usable in the general population.
Chapter 3. Literature Review

There are many literary studies that define the U.S. healthcare crisis, but few are specific to adoption of healthcare platforms. However, recently, books, such as *Platform Revolution* (Parker, Van Alstyne, & Choudary, 2016), have begun to define theories and the current understanding in the overall success of platforms. More specifically, they note the importance of adoption and use. In 2017, Rad, Nilashi, and Dahlan, (2018) found there is an abundance of studies regarding IS technology adoption. However, there is a crucial element that must be added to this research. This becomes increasingly more important as applications begin to expand across sectors or industries. These elements are:

- the IT context widely used in IT adoption;
- the theories widely used in IT adoption;
- the influential variables that power IT adoption; and
- the level of research in IT adoption.

This research dissertation, grounded in design science, focuses on the adoption and use and, more closely, on theories used and variables influencing IT adoption. With a specific focus on the CareValet platform and the artifacts being developed, this dissertation will examine the influencing effect of the design science approach on healthcare related platforms. Using a snapshot of the present state of healthcare allows us to identify, within a specific region, where the U.S. healthcare system stands today and what possible opportunities in platform solutions or strategies may be of significance in improving overall outcomes.
3.1 Healthcare Crisis

The healthcare consumer has been forced to access and purchase services without any level of fiscal transparency as healthcare costs continue to rise at unsustainable rates. Some industries have seen a shift in this trend due to technology enabled consumerism. Specifically, mobile enable technologies allow consumers nearly real-time access to goods and services. According to PEW Research (PEW Research Center, 2018), 95% of people residing in the U.S. have mobile phones with 77% of the total population owning smart phones. As of 2014, there are more mobile phones in the world than people (PEW Research Center, 2018).

![American Technology Use](image)

Figure 13. American Technology Use

Mobile based technology has enabled consumers to demand “real time” solutions to their problems. The literature review indicates that mobile enabled consumers leveraged their buying power through these devices and shifted their buying patterns in the sectors of the retail and
transportation industries by leaving brick from mortar stores and transitioning to mobile app-based solutions. Almost overnight, consumers disrupted traditional, well-established organizations who believed they owned the market by shifting to technological solutions that meet their on-demand needs. One could interpret that disruptive innovations have the capability to influence large consumer adoption of products or services and displace established market leading firms and conventional norms. Looking comparatively, there are now a great number of mobile enabled applications designed to guide consumers through their healthcare experience. These mobile based solutions present an opportunity to, at the very least, shift, if not disrupt, segments of the healthcare industry and maybe even upend the entire industry.

With all this attention to consumer disruption through mobile enabled applications, there have been a great many studies on lean methodology and the development of mobile applications, but little research has explored reaching out to consumers to determine what their impressions are of the current digital environment and its meaning to them personally. Most recently, Deloitte’s Consumer Priorities in Healthcare Study (2016) consumers did just that. The findings indicated that there are four overarching themes that need to be addressed in the healthcare industry in this order:

1) consumers expect personalization via their providers,
2) economically rational coverage and care choices,
3) convenience driven use of care, and
4) digital connectivity to manage healthcare.

In the literature, it was clearly noted that there is either a lack of digital presence by health plans or a disconnection as it relates to consumers’ understanding of how these tools are used. This research seeks to better understand how SGCG employees interact with the CareValet
application as the CareValet Development Team undertakes a design science approach toward the enhancement of the digital tool.

### 3.2 Rural Health Crisis

In order to provide a clear overview of the significance of the observed group of potential adoptees of the platform, national healthcare landscape studies help define the atmosphere. Reports like The Kaiser Family Foundation 2018 Employer Health Benefits Survey offer a current and historic analysis of employer health benefit costs, coverage, benefits, access, and offerings to their employees. A detailed analysis of this study produced values that reveal why mobile app development teams like CareValet are working to tackle the rising costs of healthcare through consumer-based tools. The motivating factors in the survey included:

1) healthcare premiums are high and getting higher,

2) the cost of healthcare is outpacing inflation, and

3) a catastrophic health event can leave moderate wage earners in medical debt.

Narrowing this research to the study of adoption in a rural county, the SGCG employees represent a population in need of a solution to their healthcare access and care needs. The February 2014 article in *The Washington Post* entitled, “In Rural Georgia, Federal Health Insurance Marketplace Proves Unaffordable to Many,” produced in conjunction with Kaiser Health News, revealed that costs in the region in which the SGCG employees receive care are on par with the most expensive healthcare services in America, namely Vail, Colorado (Rau, 2014). This proved interesting to the research as Vail, Colorado is one of the most affluent regions in the U.S., while Southern Georgia counties are some of the poorest areas in the country comparatively. This information supports the value of the research as it is directly correlated to
the importance of the inspiration of the CareValet mobile application and, ultimately, its consumer adoption, but also the need to put solutions into the hands of consumers that support meaningful and usable cost efficient outcomes.

3.3 Consumer Healthcare Priorities

Studies like the Deloitte (2016) Consumer Priorities in Healthcare Survey presented consumer insights and analysis from an independent organization. This document provided the CareValet Development Team with information addressing consumer behavior and identifying priorities concerning their healthcare needs and digital platform preferences. While the details of this study don’t directly address adoption, they do provide insight into consumer preferences toward the use of a consumer platform by identifying four core categories from 64 data points related to their healthcare preferences.

| 1. Personalization expected via providers (doctors, hospitals, and other health care providers) – 6 interactions, scoring on average 2.9x above the expected average (of 1.6) (i.e., significantly above average) |
| 2. Economically rational coverage and care choices – 8 interactions, scoring on average 1.9x above the expected average (i.e., above average) |
| 3. Convenience driven access and use of care – 15 interactions, scoring on average 0.7x of the expected average (i.e., slightly below average) |
| 4. Digitally connected to manage health care – 18 interactions, scoring on average 0.3x of the expected average (i.e., meaningfully below average) |

Figure 14. Four Core Consumer Priorities

These four points proved to validate the path and structure developed in the CareValet application. They also provided guidance regarding ongoing strategies as the team addressed continuing development focused around the rural health population. The CareValet application
already contained the four preferences defined in the study and interpreted the preferences as follows:

1. Personalization expected via providers: The CareValet app lists all available in-network providers, gives the consumer the ability to categorize their providers in a favorites section, provides all contact information for the providers (i.e., contact and location mapping), and 24/7 access to telemedicine physicians.

2. Economically rational coverage and care choices: Providers ranked green in the application are in-network with potentially lower costs and higher quality, yellow are in-network with higher costs and lower quality, or red that are out-of-network providers or providers not recommended.

3. Convenience driven access and use of care: Providers are geographically located based on the consumer’s present location, and appointments can be scheduled electronically. The CareValet goal is to make every possible selection easy by putting the consumer one to two selections away from a result.

4. Digitally connected to manage healthcare: The CareValet is designed to be easy to use in a mobile app or via the web.

Based upon the Deloitte literature review, the design of the CareValet mobile application would appear to support successful adoption and use, but the question remains did the CareValet team develop a platform that meets the adoption and use needs of the consumers?

3.4 Platform Design

The platform is a simple sounding yet transformative concept that is radically changing business, the economy, and society at large (Parker et al., 2016). These platforms are leveraging
available technologies, breaking through long held barriers on theories, such as status quo bias, and utilizing other theories including nudge theory to fulfill consumer needs. According to Parker et al. (2016, p. 198), “a platform is a business based upon enabling value-creating interactions between external producers and consumers. The platform’s overarching purpose: to consummate matches among users and facilitate the exchange of goods, services, or social currency, thereby enabling value creation for all participants.” Using Uber as an example, the network effect of a scalable platform can solve traditional linear business models and not only transform industries, but create massive value for all stakeholders. David Sacks, co-founder of Yammer and a PayPal veteran illustrated how the cycle works.

The illustrated example below illustrates how Uber leveraged network effects by creating value for each of the users the more they used the application. This, in turn, created greater value for the service and increased the value of the platform. A positive network effect develops when a large, well-managed platform produces significant value for each user on the platform (Parker et al., 2016). This is the primary source of value creation and creates a competitive advantage in the platform business.

Figure 15. Network Effects Loop
CareValet is a platform that enables consumers and providers to interact. As stated in the literature, traditional businesses have a pipeline or linear value chain. This traditional model is a business of people or a build it and hope they come. A platform is system that connects and conducts interactions between consumers and producers. The design is established to eliminate gatekeepers which, if built properly and adopted, promotes the business to scale more efficiently. Again, the outcome effect is intended to be large scale value for all shareholders through positive network effects. However, network effects can also be negative if the platform is poorly managed ultimately reducing the value for each user. These negative effects can lead to reduced use of the platform or de-adoption of the platform all together.

3.5 Adoption Theory

Experts do not necessarily agree on the definition of adoption. In their paper, Wisdom, Chor, Hoagwood, and Horwitz, (2015), adoption is roughly framed and loosely defined by the following three references:

1. Adoption usually begins with the recognition that a need exists, moves to searching for solutions, then to the initial decision to attempt the adoption of a solution, and, finally, to the actual decision to attempt to proceed with the implementation of the solution (Damanpour & Schneider, 2006; Gallivan, 2001; Mendel, Meredith, Schoenbaum, Sherbourne, & Wells, 2008).

2. Greenhalgh, Robert, Macfarlane, Bate, and Kyriakidou (2004) characterized the adoption process as: pre-adoption (e.g., awareness of innovation), periadoption (e.g., continuous access to innovation information), and established adoption (e.g., adopters’ commitment to the adoption decision).
3. Alternatively, Frambach and Schillewaert (2002) discussed two stages associated with adoption: the organization’s decision to pursue adoption and the staff’s acceptance and initiation of their individual processes of accepting the innovation. Adoption will either move to initial implementation activities or revert to a dead option.

A fourth definition of adoption emerged specifically as it relates to platform businesses and is most closely reflective of Frambach and Schillewaert’s (2002) thoughts on adoption. According to the Platform Revolution authors, user commitment and active usage, not sign-ups or acquisitions, are the true indicators of customer adoption. (Parker et al., 2016). For the purposes of this dissertation, the focus will more closely follow Parker et al.’s (2016) definition of adoption with a heavy emphasis on the consumer sign-up process and a more cursory review of early stage usage as this definition specific to the platform business.

Rad et al. (2018, p. 361) defines adoption as, “the acceptance or the first use of an emerged technology or product.” This normally occurs when a user downloads a mobile application or registers within an app or website. This event begins the first level of adoption. There are many theories that support adoption and adoption behavior.

The literature connected to behavioral change models listed below provide insight into adoption behavior that enhances the research. These models in varying forms will frame the population exposed to the CareValet platform and provide research worthy insight into their behavioral characteristics as they chose whether or not to adopt. These theories are:

1. The Health Belief Model (Skinner, Tiro, and Chamption, 2015) – A person’s belief in the threat of the illness or disease along with the person’s belief in the effectiveness of the behavioral change (or treatment) will dictate adoption.
2. Diffusion of Innovation Theory (Rogers, 1962) – There are five categories of adoption of innovation: Innovators (i.e., those who want to try the new innovation), Early Adopters (i.e., embrace change opportunities, typically leaders), Early Majority (i.e., need to see evidence the product works before they will try it), Late Majority (i.e., skeptics of change and only adopt after the majority has done so), and Laggards (i.e., conservatives and skeptics of change who may only adopt if required to do so). Due to the limited time of this study, we will be able to observe adoption among Innovators and Early Adopters.

3. The Social Cognitive Theory (Bandura, 1986) – Taking into account a person’s past experiences that influence whether a behavioral action will occur.

4. The Trans Theoretical Model (Prochaska & DiClemente, 1997) – This is a model of an individual’s decision making as they make an intention to change.

5. Social Norms Theory (Perkins & Berkowitz, 1986) - Peer influence, and the role it plays in individual decision making around behaviors, is the primary focus of Social Norms Theory.

6. The Theory of Planned Behavior (Ajzen, 1991) – This theory surrounds intent and the likelihood that the behavior will result in an expected outcome.

While each of these theories play important roles in the theory of adoption, social norms theory has the potential to be a greater influencer. This is primarily due to the way the CareValet Development Team approached their goals toward adoption and use. CareValet designed an adoption strategy that engages leaders in an employer group. The program is called CareValet Champions. These champions engage and support any digital nudge strategies sent through push notification to the employer population of a client group. Their goal is to provide a positive
social feedback loop to the strategy being promoted and the intended outcome is improved engagement in the form of app adoption and increased use. While there were several possibilities to associate with CareValet’s strategy, social norms theory appears to be most connected to their goals. This will be explored further in Chapter 5.

3.6 Use

Businesses that have successfully navigated the platform model have achieved positive network effects. While there are many factors that attribute to success, all of them ultimately point to the value of positive levels of adoption and use. In order to achieve these effects, new consumers to a platform must be guided to the use areas within it. Ultimately the consumer would need to find significant value in the presented solution for the application to achieve positive network effects. The main influencer of these positive network effects is ongoing use.

There is limited literature addressing IT system use. Rad et al. (2018, p. 370) concluded, “‘actual system use,’ which is a dependent variable, recorded the lowest frequency of use in the reviewed papers on IS adoption studies because of the complexities involved in measuring this dependent variable, and as such, was avoided by most researchers. It is therefore suggested that future research in this domain should use this variable in their IT adoption studies as it is the ‘actual system use’ that ought to be measured and studied in the current IT adoption studies. Most of the IT adoption studies have attracted several criticisms largely due to ‘intention to use’ plethora.” We were inspired to provide a scholarly approach to exploring the influencing factors that promote a consumer’s use in a platform. In the research that was identified, most theories of adoption defined adoption and use synonymously. We were unable to locate studies dedicated specifically to “use” of a platform.
Parker et al. (2016, p. 45) identified a platform challenge related to use they named “pull.” The first pull challenge is that, “users won’t come to the platform unless it has value” and the second pull challenge is “keeping the interest of users who visit or sign up for the platform.” They proposed “feedback loops” as a powerful tool to keep users returning to the platform. Feedback loops can help facilitate many functions, but the primary goal is to create a constant stream of self-reinforcing activities. These self-reinforcing activities can also be called nudges.

3.7 Nudge Theory

Technology overload contributes to consumer confusion by exceeding an individual’s cognitive capacity (Benartzi & Learner, 2015; Zahn & Rajamani, 2008). Platform designs must be intuitive to the user for the application to be digestible and have any possibility of success. Choice architecture supports intuitive thinking and promotes simplicity of use in digital environments. The concept of nudging in this environment is based upon the idea that a suggestion, utilizing behavioral methods, can improve human decision making. Platforms designed intuitively and utilizing choice architectures that promote a digital nudge can serve as a decision making guide (Thalar & Sunstein, 2009) that provides guard rails down a well paved road for users. In essence, effectively designed digital nudges can promote non-intrusive decision making pathways that lead individuals to their desired outcome without over engagement that can promote disengagement.

Since the CareValet platform is leveraging digital nudging as its primary artifact to promote utilization and maintain engagement, it is important to identify how scholars define a digital nudge. Digital nudges leverage a user interface design to guide an individual’s behavior in
digital choice environments to improve their decision making (Weinmann, Schneider, & vom Brocke, 2016). Hansen (2016, p.174) provided this definition:

“A nudge is a function of any attempt at influencing people’s judgment, choice or behavior in a predictable way, that is (1) made possible because of cognitive boundaries, biases, routines and habits in individual and social decision making posing barriers for people to perform rationally in their own self-declared interests and which (2) works by making use of those boundaries, biases, routines and habits as integral parts of such attempts. Thus a nudge amongst other things works independently of: (i) forbidding or adding any rationally relevant choice options, (ii) changing incentives, whether regarded in terms of time, trouble, social sanctions, economic and so forth, or (iii) the provision of factual information and rational argumentation.”

Nudging functions off two levels of thinking: Kahneman (2011) System 1 and System 2 thinking. Known as dual process theory, there are variances between biased and rational decision making. Kahneman (2011) calls them System 1 and System 2 thinking. System 1 thinking (biased) is rapid, automatic, and intuitive. System 2 thinking (rational) is slow, deliberate, and intentional. System 1 thinking incorporates automatic memory recall and perception. System 1 thinking is instinctive and emotional, while System 2 thinking is deliberate and logical. Digital nudging is focused around System 1 thinking.

Sunstein (2014) breaks down nudging into these self-reinforcing activities:

1. Maintain freedom of choice,

2. Have transparency and effectiveness, and

3. Need for evidence and testing (have measurable outcomes).

These three elements provide potential guidance and consideration into digital nudge design.
According to Mirsch, Lehrer, and Jung (2018, p. 2), “the use of digital nudging in practice is not widespread because practitioners are often not aware of the concept or if they are aware of it, they miss a systematic approach to design digital nudges.” While there are some nudge design methods available in research, the research is in its early stages and they are limited in availability. For the purposes of the CareValet nudge artifact development, we relied on some of the following studies. Drawing on guidelines for implementing nudges in offline contexts (Datta & Mullainathan, 2014; Ly, Mazar, Zhao, & Soman, 2013), Schneider, Weinmann, and vom Brocke (2018) propose a process comprised of four phases: 1) define the goal, 2) understand the users, 3) design the nudge, and 4) test the nudge. These phases are taken into consideration when non-digital nudging was required to observe a nudge outcome. For digital nudging, the Digital Nudge Design Method provided guidance. This method consists of four main phases: 1) defining the digital nudge context, 2) digital nudge ideation and design, 3) digital nudge implementation, and 4) digital nudge evaluation.

Figure 16. Digital Nudge Design Method (Mirsch et al., 2018)
3.8 Assimilation Gaps

When new technology is acquired by stakeholders, multiple levels of adoption (or acceptance) of the service or product are deployed to engage a population in the product producing a use effect. However, many times when these technologies are acquired, the level of use effect is not achieved. The measurement of these use effects can determine whether the product or services have succeeded or failed. The measurement between that success and failure is known as the assimilation gap.

Fichman and Kemerer (1999) identified the assimilation gap as an effect that occurs when a firm acquires new information technology and either achieves or fails to deploy the technology. Assimilation gaps are an appropriate measure of identifying the value a mobile healthcare platform may have among its targeted stakeholders. Such a value measurement can determine the contributing factors for adoption and use on many levels within this study or even in correlating programs needing to measure product worth. In our study, using platform as an example, adoption is measured in the same way technology is graphed from an acquisition perspective, and use is measured in the same manner new IT would be observed as it succeeds or fails to deploy. As these two metrics are plotted and measured over time, the graph displays where there is a narrowing effect that demonstrates positive value or a widening effect that indicates a mitigation of benefit. This measure, along with the added value of the return on investment, has the ability to contribute to the assimilation gap research.

The presented theories and the referenced literary research are presented to provide guidance and a framework to support the discoveries and outcomes defined in the research questions. Grounded in design science research and supported through elaborated action design research (Mullarkey & Hevner, 2019), we intend to connect how the healthcare crisis within a
rural community may be influenced by consumer priorities in healthcare through platform design and measured by adoption, use, and nudges.
Chapter 4. Research Methods

4.1 Design Science

Research in IT that uses a design science paradigm is fundamentally proactive. Its goal is to create innovative artifacts that extend human and social capabilities and seek to achieve desired outcomes (Hevner, March, Park, & Ram, 2004). Following research methodologies grounded in the design science approach helped us to develop a framework to answer the research questions surrounding adoption and use artifacts. Hevner et al. (2004, p. 23) notes that “a design science contribution must articulate an important problem and build an innovative artifact that addresses it.” The CareValet team has a platform that can leverage such artifacts, but acknowledge that continued use of design methodologies and processes would further improve life cycle development knowledge and provide valued documentation toward platform development.

4.2 Elaborated Action Design Research

We chose the elaborated action design research process (EADR) for a high-level evaluation of the artifact development. This methodology appears to be best suited for identifying important research data and processes that will contribute to the overall platform development community. As stated, “ADR (Action Design Research) is used effectively in many research projects and, because of its ever-expanding applications, the ADR concepts and process model continue to grow and evolve to meet the demands of new and challenging environments” (Mullarkey & Hevner, 2019, p. 1). We developed a strategy using the elaborated ADR method
since this research provides information regarding the process utilized to improve the consumer adoption levels of the CareValet platform. Further, the elaborated ADR process allows for the structured tracking of the adoption goals of the CareValet Development Team as they move through each iteration defined in the elaborated ADR process.

The CareValet platform was initially created in 2016, but recently implemented one of its beta customers in 2018, a self-funded South Georgia county government group and its employees. The group was implemented in January of 2018. The strategy behind the connection and use of the EADR cycle is to provide a guideline for the ongoing measurement of the designed artifacts and to capture any valued research that results from the measurements in this methodology. The research encompasses a historic conception of the platform and measures each step of the diagnose, design, implement, and evolve cycle as illustrated in Figure 17.

Figure 17. The Four ADR Stages

Working with the CareValet team, we offered an evaluation and measurement strategy utilizing these methodologies. The process was defined as follows.
**Diagnose.** Review of the development of the artifact, its intent, goals, outcomes, and value contribution. Understand the application domain of the project to include specific knowledge of the practitioner’s organization with its strengths, weaknesses, opportunities, and constraints (Mullarkey & Hevner, 2019).

**Design.** Document the design process of the artifact exploring the how’s and why’s of the design cycle. What other methods may have been used and the importance of those methods and how it solves the observed research problem or challenge.

**Implementation.** A real-life intervention provides the opportunity to perform onsite evaluations of the efficiency and effectiveness of the proposed design (Mullarkey & Hevner, 2019). In this stage, the team documents the process in practice and identifies any barriers to achieving the intended goals. We document how the CareValet team introduced the platform to the SGCG employees, what methods they used in the implementation, and the outcomes.

**Evolve.** In this stage, we discuss the CareValet team observations regarding the outcomes achieved by the implemented artifact. Did the results meet or exceed intended outcomes? If not, are design changes required and more cycles of development? If so, do they meet the CareValet team’s documented standards? Are there other standards the team should consider to measure against?

Since Mullarkey and Hevner (2019, p. 2) determined that, “at the outset that the ADR process must generate design knowledge that creates innovative artifacts and addresses an organizational need for intervention,” the research also follows the CareValet team as they break down the results of the EADR process as defined.

This new model (the EADR cycle) opens the door for researchers and practitioners to address the process of ADR at any stage of the cycle. The illustration below defines five
segments of the Guided Emergent, Iterative Intervention Cycle and the process the team will use to reveal new knowledge about the adoption of the CareValet platform:

1. Problem Formulation – Did the adoption levels meet expectations?

2. Artifact Creation – Did the artifact meet the needs of the consumer or were there barriers that require platform updates?

3. Evaluation – What areas of the platform require the most attention?

4. Reflection – What could or should have been done differently?

5. Learning – What information in the implementation process provided the most value?

After each stage (i.e., diagnose, design, implement, and evolve), we will observe and document the CareValet Development Team as they move through each additional iteration: Evolution, Diagnose, and Design.

Since we are observing both the adoption and use within this research, the EADR model has significant value to serve as guidance when determining the entry point of the standard ADR cycle. As Mullarkey and Hevner (2019) identify, depending on the type of problem you are solving, certain entry points may present a more practical approach. The following illustration identifies these points:

![ADR Process Model with Research Entry Points](image)

Figure 18. The ADR Process Model with Research Entry Points
Each entry point is defined by the activities that are recommended to be engaged to move toward a measurable solution. In Chapter 5, the CareValet Development Team attempts to move toward an adoption solution in a predeveloped artifact. The entry point in this methodology is “Problem Centered” (see Figure 18). In Chapter 6, as the CareValet Development Team addresses solving use in the artifact, the problem-centered approach assists in indicating the entry point of the ADR cycle.

<table>
<thead>
<tr>
<th>Entry Point Titles</th>
<th>Description</th>
<th>Activities</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem-centred</td>
<td>Understand and define the specific research problem; Understand and define the solution space</td>
<td>Problem Identification; Motivations and Goals for ADR Project</td>
<td>What is the problem to be solved in practice?</td>
</tr>
<tr>
<td>Objective-centred</td>
<td>Explore the design options based on project objectives; Generate design knowledge of what is feasible in the solution space</td>
<td>Solution Design; Development of Design Principles</td>
<td>Why do existing solutions fall short?</td>
</tr>
<tr>
<td>Development-centred</td>
<td>Develop an ensemble instantiated artefact (e.g., system to address research problem; Demonstrate satisfactory solution</td>
<td>Solution Implementation; Demonstration of Solution</td>
<td>What would a better artefact accomplish?</td>
</tr>
<tr>
<td>Observation-centred</td>
<td>Observe existing system in context; Identify possible evolution opportunities for system improvements</td>
<td>Improvement Goals; Evolution Possibilities for Existing Systems</td>
<td>What is critical design principles and features?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>What is possible?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>What is feasible?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>How does the instantiated artefact solve the problem?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>How to evaluate the goodness of the solution?</td>
</tr>
</tbody>
</table>

4.3 Adoption in the EADR Cycle

The design method of addressing adoption while using the EADR cycle indicates that the CareValet Development Team will take a problem-centered approach. This approach indicates the entry point of the ADR cycle will be in the Diagnosis stage since the artifact required development and the test of adoption outcomes occurs with the implementation of the SGCG group. Figure 19 is designed as a diagram to guide and complete the research.
4.4 Use in the EADR Cycle

The EADR use cycle also takes a problem-centered approach in the development of the nudge artifact. Figure 20 speaks to the diagnosis by addressing how the artifact will influence the measured use values of telemedicine and appointment setting. The design will outline the development of the tools required to manage digital nudging within the platform. The implementation phase frames the specific nudges that will be used, while in the evolution stage, observations will be made to evaluate the nudge(s) effectiveness.
Figure 20. The Mobile Health Platform Development Cycle and Use Process.
Chapter 5. Adoption

Platform adoption is the initial step in ensuring the success of any mobile healthcare platform. For this study, we conceived four EADR design cycles intended to influence adoption levels. Each cycle is measured over time to indicate the effect each design cycle has on adoption. The artifacts developed in this study occur outside of the platform and are designed to influence adoption. Using the design science approach, artifacts are introduced in each cycle to improve upon the results of the previous cycle. Our initial design cycle addresses adoption during platform introduction. The second approach is the initial platform enrollment, followed by two additional cycles addressing platform enhancements that influence adoption improvements and future planning for platform redesigns. These design cycle iterations lead to demonstrating the value of adoption as the first measurement metric in assimilation gaps measured in Chapter 6.

5.1 Problem

With the development of the artifact, an Action Design Research study was selected for the research as we felt it was best suited to validate or invalidate the proposed hypotheses. According to Baskerville, Baiyere, Gregor, Hevnor and Rossi (2018), the goal of design science research is to invent new artifacts where none previously existed and improve existing artifacts to enhance organizational, group, and individual human productivities and effectiveness (Walsham, 2012). This is evidenced by the fact recent research has identified there is limited literature addressing IT system use in general.
While there is copious research related to adoption of IT systems, there is not a lot of research regarding the measurement of adoption specifically as the studies relate to mobile healthcare platforms. Further, the research identifying adoption addresses both adoption and use in the same measurement of adoption. There is value in breaking these two apart.

For this purpose, we chose to observe the value of adoption in a mobile healthcare platform. The adoption of the platform specifically observes the enrollment of eligible members on to the platform. In order to distinguish adoption from use, we chose to define use separately. Use in this study is measured after an eligible member enrolls and then utilizes the platform services (See Chapter 6). Thus, we followed Rad et al. (2018, p. 361) as they defined adoption as, “the acceptance or the first use of an emerged technology or product.” The specific user action is defined as when a user downloads a mobile application or registers within an app or website.

“The action design research (ADR) paradigm has been effectively and consistently applied in a number of interesting research contexts. As its use expands, researchers will gain new understandings of how best to perform ADR and will continually evolve the ADR techniques and processes accordingly” (Mullarkey & Hevner, 2019, p. 10). On a broad scale, the research explores stakeholder relationships between healthcare consumers and their health plans. The platform measures interactions and relationships between the consumer’s use of their mobile healthcare portal engagement with their healthcare providers and other digital tools. This contribution, however, explores utilization patterns of users and whether those patterns can direct the mobile development team to shift or redesign development strategies in order to improve utilization and adoption outcomes (a.k.a. the evidence). Evaluating adoption measures through the development (and redevelopment) of the artifact is specifically intended to improve adoption.
The value of this research is guided through the development cycles of an EADR model. This research introduces tools that allow platform development teams to better define consumer behavior associated with the adoption of a mobile health platform through iterative designs. Ultimately, design cycle intervention value is determined through its influence and improvement of adoption levels in the mobile healthcare platform.

5.2 Adoption Strategy

In order to best apply EADR methodology, this study observes the CareValet Development Team as they collaborated to measure and improve adoption. Following the design cycle in the EADR approach, nudge strategies are applied to achieve the intended outcomes.

To establish a clear path of measurement, we defined the research question for adoption as follows:

**RQ1)** How adoptable is the CareValet platform in a rural population?

Based upon the research question, a hypothesis was established based upon expected and intended outcomes levels.

**H1 based on RQ1)** It is theorized by using the EADR cycle the CareValet mobile health platform will achieve adoption levels above the national average of 7%.

The SGCG group has 155 employees and a total of 256 eligible members that include dependents. These 256 members are eligible to enroll on the platform. The CareValet team
identified that this is a multi-location employer group. As such, a series of enrollment meetings are required to communicate that the CareValet platform will be available during the open enrollment period. Following EADR methods, we established this entry point as a problem-centered approach, which is appropriate in order to measure and address the CareValet Development Team’s goals.

CareValet as a platform is attempting to solve a two-sided network effect in the healthcare marketplace by bringing together members of a health plan and their intended providers of care. In order to interconnect this value, initial communications to the intended stakeholders must have a level of perceived value to move them into action. As the CareValet Development Team sets out to achieve or exceed the adoption goals established, the research measures nudge effects to determine whether the artifacts introduced in each adoption design cycle (see Figure 21) promote improvements in adoption levels. Through each EADR cycle, we evaluate the effectiveness of each cycle to determine whether the value proposition (i.e., the artifacts) of the digital platform meet the adoption goals. After each iteration, and dependent of the outcome, we, along with the CareValet Development Team, determine whether additional design cycles will needed to achieve the goal.

Adoption Design Cycles

Figure 21. Adoption Design Cycle Strategy
The areas measured that effect adoption levels are:

1. Artifacts introduction: Nudges,
2. App downloads and registrations, and
3. Feedback from user sign up experience.

The research follows each cycle associated with the adoption strategy using the intervention cycle format below.

Table 6. Problem-Centered Design Cycle

<table>
<thead>
<tr>
<th>Design Cycle Plan: Problem-Centered Entry Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation of the artifact and designed materials as an influencing factor to platform adoption</td>
</tr>
<tr>
<td>Problem Formulation</td>
</tr>
<tr>
<td>Artifact Creation</td>
</tr>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Reflection</td>
</tr>
<tr>
<td>Learning</td>
</tr>
</tbody>
</table>

The problem-centered design cycle model is presented to provide a rigorous process that defines how the artifact is measured in each cycle. The problem formation addresses how the cycle design strategy attempts to meet the adoption goal in that cycle. The artifact creation specifies what artifacts are created. Evaluation informs the research regarding stakeholder feedback. Reflection considers the researchers and design team feedback. Learning considers the value of the input and, depending upon the outcome, initiates the next design cycle.
5.3 Designing the Artifact

To ensure the adoption is promoted and the design cycles are set up for success, a review of the CareValet enrollment materials presented during the open enrollment process is completed. The materials comprised the initial contribution to the artifact intended to nudge the members into enrolling on the platform. They are:

1. A Promotional flyer on CareValet,
2. The CareValet slide presentation,
3. The CareValet marketing video, and
4. The CareValet squeezy stress phone.

These nudge materials are selected to make up the artifact as they communicate information in a way that can achieve the best levels of adoption. By appealing to the senses, the goal is to provide the prospects with materials they can see, touch, and hear. The strategy was designed to leave them with a longer-term impression in the first meeting since their first opportunity for enrollment would not be for more than a month. Additionally, medical claims data suggests health plan members will only refer to or use their medical plans when they are sick, so creating the longest-term impression is important. The materials that make up the artifacts include the following.

The platform. As defined in Chapter 2, the platform was carefully designed using lean and agile methodologies following the Lean Entrepreneur workbook (Cooper et al., 2013). With the CareValet team, we patterned a presentation that took into account the recommendations from the Consumer Priorities in Healthcare Survey (Deloitte, 2016) that identified four important consumer priorities in healthcare:

Priority One: Personalization expected via providers.
Priority Two: Economically rational coverage and care choices.

Priority Three: Convenience-driven use of care.

Priority Four: Digitally connected to manage healthcare.

Figure 22 provides a screen shot of the user experience in the platform. Each feature has a use value and is only available after the SGCG member enrolls on the platform.

Figure 22. CareValet App Sample

**Promotional flyer.** A promotion flyer on CareValet was designed to provide simple steps on downloading the app, critical dates, and registration instructions. In order to effectively communicate with the prospective users and ensure the best possible enrollment, working with the CareValet team, we determine the best opportunity to communicate over the month prior to enrollment would be to do a mail out the week prior to the December 5th open enrollment meeting, present the materials at the open enrollment meeting, and then insert the flyer as a payroll stuffer the first week of January when the app would be available to download.
Taking into account the Consumer Priorities in Healthcare Survey (Deloitte, 2016), we worked with the CareValet team to effectively communicate the four healthcare priorities in a brief nine slide presentation.

**The CareValet video.** To ensure we had the greatest opportunity for adoption, a plan to email the CareValet video link was established to notify the SGCG members the app would be eligible to download.

**The CareValet squeezy stress phone.** To promote the see, touch, and hear theme, it was determined a leave behind in the form of swag would be presented. A squeezy stress phone was designed and distributed at the December 5th open enrollment meeting along with other more traditional swag items like pens.
In order to measure effectiveness of the designed adoption strategy, the adoption levels are measured and reported after the initial enrollment period in January. Thereafter, we work with the CareValet Development Team to identify whether the adoption levels have been met and determine whether barriers to adoption exist and if additional EADR cycles are required to meet or exceed the 7% adoption level goal.

**Cycle 1.** In Design Cycle 1 presented in Table 7, the problem formulation considered the SGCG members’ intent to engage in utilization of the platform. The artifacts created in this cycle were evaluated in group meetings with the client stakeholder to identify the resources that make up the nudge materials. The SGCG members are evaluated to determine a sense of willingness to adopt a new technology. CareValet and the research team reflected to create a criterion for measuring adoption once the platform is made available in group meetings. In the learning phase, the team established a plan to develop future design cycles if adoption levels are not met.

Table 7. Adoption Design Cycle 1

<table>
<thead>
<tr>
<th><strong>Problem Formulation</strong></th>
<th><strong>Evaluate intent adoption of the artefact and the effectiveness of the designed materials as an influencing factor to platform adoption</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Artifact Creation</strong></td>
<td><strong>Presentation of materials to consumer stakeholder intended to influence adoption:</strong></td>
</tr>
<tr>
<td></td>
<td>• The CareValet App</td>
</tr>
<tr>
<td></td>
<td>• A Promotional flyer on CareValet</td>
</tr>
<tr>
<td></td>
<td>• The CareValet slide presentation</td>
</tr>
<tr>
<td></td>
<td>• The CareValet marketing video</td>
</tr>
<tr>
<td></td>
<td>• The CareValet squeezy stress phone</td>
</tr>
<tr>
<td><strong>Evaluation</strong></td>
<td>• 155 eligible consumer stakeholders</td>
</tr>
<tr>
<td></td>
<td>• 5 adoption influencing interventions</td>
</tr>
<tr>
<td><strong>Reflection</strong></td>
<td>• Begin adoption timeline outcome measurements</td>
</tr>
<tr>
<td><strong>Learning</strong></td>
<td>• Observation of SGCG member level of interest in enrolling in the CareValet app</td>
</tr>
</tbody>
</table>
On December 5, 2018, the CareValet team presented the platform to the employees of the South Georgia county government group (SGCG) in a series of health plan open enrollment meetings. To provide some background, these annual open enrollment meetings are generally designed to communicate benefit options available to employees and their dependents. They typically include health plan premium costs, benefits covered, copayments, deductibles, and coinsurance information, as well as other benefits and services made available through the employer. This meeting included the presentation of the artifacts, a promotional flyer, a slide presentation, a marketing video, and swag. The SGCG benefit meetings occurred at multiple locations including the Sheriff’s Office, the prison, the vehicle maintenance facility, and the County Clerk’s Office, so they would be convenient to the employees of this multi-location employer.

**Cycle 2.** In Cycle 2 presented in Table 8, the research focus evaluates the adoption outcomes based upon the artifacts presented in the problem formulation step. In artifact creation, the CareValet team turned on the platform and made it available to the members. Notifications were sent to members alerting them to the sign on availability. The evaluation step measured the enrollment outcome by tracking platform enrollments. In reflection, the team establishes consumer feedback steps if the enrollment levels meet the 7% threshold. The learning phase establishes planning steps to address consumer feedback and create new strategies to improve the nudges.
On Monday, January 7, 2018, the CareValet platform was turned on for the group employees to begin registration in the app and on the web. We were presented with the results of the enrollment at the end of each month. By the end of January, 2% of the eligible members downloaded and adopted the application either through their mobile device or via the web. These results were unsatisfactory to the CareValet Development Team and the client.
As part of the reflection, we, along with the CareValet team, created a strategy to determine why, at the end of 30 days after the introduction of the artifacts, the adoption levels were below the standards set. As stated previously, most members of a health plan only engage their health plans solution at the time they require service. Because of this fact, the artifact’s adoption could take time. The development goal of the artifact, however, was to create a level of value that exceeded traditional platform solutions in order to solve a greater problem in this rural community. Working to achieve this goal, additional EADR cycles are established. The team decided to return to the SGCG offices to assist with enrollment and gather feedback that could promote additional design cycles aimed at improving adoption.

**Cycle 3.** The problem in Cycle 3, presented in Table 9, created an opportunity to observe the SGCG members as they went through an onsite enrollment and determine barriers. Onsite focus groups provided design evolution options affecting the artifacts that advance nudges, improve adoption, address platform design, and enhance the enrollment experience. We reflected on the consumers’ willingness to adopt based upon the feedback vs. the actual adoption numbers. Examination ensued to learn about the value of the current artifacts and determine whether new or revised artifacts should be created.

Table 9. Adoption Design Cycle 3

<table>
<thead>
<tr>
<th></th>
<th>Design Cycle 3: Problem-Centered Entry Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Formulation</td>
<td>Evaluate any adoption barriers through an onsite enrollment visit</td>
</tr>
<tr>
<td>Artifact Creation</td>
<td>• Determine any design evolution requirements</td>
</tr>
<tr>
<td>Evaluation</td>
<td>• Determine interest in enrollment</td>
</tr>
<tr>
<td></td>
<td>• Determine barriers to enrollment</td>
</tr>
<tr>
<td>Reflection</td>
<td>• Determine consumers willingness to adopt artifact</td>
</tr>
<tr>
<td>Learning</td>
<td>• Establish plan to address concerns for low/high adoption and acceptance of artifact</td>
</tr>
</tbody>
</table>
On February 18-19, the CareValet Development Team returned to the SGCG to participate in a follow up open enrollment. The CareValet team was available to receive feedback regarding barriers to enrollment and to learn about any possible enhancement that might improve adoption rates. During this follow up enrollment meeting, several employees of the SGCG identified that as they attempted to register within the platform, there was a problem with selecting their birthdate (i.e., a requirement for enrollment) so they abandoned the enrollment in the platform. In the mobile application, a new user had to scroll to select their date of birth. The year scroll started at 1900. Users had to scroll through 50-100 years of dates to get to their actual year of birth as there was no shortcut to enter the date. Employees were exiting the enrollment process before they completed it because it was taking too long. This information was important as it provided an example of what happens when you force a consumer into System 2 thinking when they were in a System 1 mindset. System 1 thinking is fast, intuitive, and emotional, while System 2 thinking is slower, more deliberate, and more logical (Kahneman, 2011). It was apparent that this cognitive disruption was enough to cause many members from enrolling in the app. With the focus on improving adoption outcomes, the CareValet team immediately set up laptops at the enrollment location and assisted members in the enrollment process. This was done because the web application allowed members to more easily select their birth date. Because of this change, the adoption rate grew to 19% of the SGCG population at the end of February and exceeded the 7% adoption goal.
It was noted by the researchers and the CareValet team that further artifact development would be necessary in order to improve the user experience and support consumers more intuitive mindsets through the enrollment process by removing barriers to adoption. Additional researcher/team collaboration determined additional EADR cycles could be beneficial to continue adoption improvement.

**Cycle 4.** The problem formulated in Design Cycle 4 was established to evaluate additional barriers to onsite or platform enrollment. Present artifacts were working, but required manual intervention so new artifacts were necessary to reduce enrollment steps. Other nudge opportunities include the promotion of a $50 wellness incentive. Evaluation would include the ongoing monthly measurement of adoption levels to observe the effects of the enrollment simplification and other nudges. Reflecting on the adoption level against the nudge effects on the timeline can reveal which artifacts had the greatest influence on adoption. The learning phase in Cycle 4 presents an opportunity to identify theories that most support and influence adoption.
Table 10. Adoption Design Cycle 4

<table>
<thead>
<tr>
<th>Problem Formulation</th>
<th>Evaluate any adoption barriers through an onsite enrollment visit</th>
</tr>
</thead>
</table>
| Artifact Creation   | • Reduce # of steps associated with downloading and registering on artifact  
                      • Build a nudge using $50 wellness incentive |
| Evaluation          | • Measure adoption levels month over month                       |
| Reflection          | • Identify practices that supported adoption                      |
| Learning            | • Contemplate theories that influence adoption                     |

The CareValet team returned to SGCG on March 1, 2019 to promote a benefit that was available if the members scheduled their annual wellness visit. There was an improvement in registration to the platform, primarily due to a nudge within the benefit plan that was communicated by the employer prior to the March 1st enrollment visit. The nudge was communicated in the member’s paycheck (e.g., this group still uses manual checks and does not do direct deposit) and informed members they would be incentivized with a $50 payment if they scheduled their annual wellness appointment. This payroll stuffer with the incentive information was distributed the Friday before the CareValet team visit. Since the SGCG does not do direct deposit, payroll stuffers still have value with this group. This resulted in an adoption rate of 33% by the end of March, leaving the CareValet team with a comfortable level of adoption, albeit short of their long-term adoption impact goals. This nudge appeared to support the growing adoption through the measurement period.
Adoption rates after Cycle 4 exceeded the 7% initial expectation and are above 45%. The client is pleased with the present level of adoption as noted in Figure 26. The CareValet Development Team feels the adoption levels could jump even higher. Following EADR guidelines associated with demonstrating rigor, the researchers and the CareValet team collaborated to establish additional methodologies and practices for expanding adoption within the platform. The team determined that additional programming would be required to simplify the enrollment process. Feedback during the enrollment meetings revealed the members had too many steps to accomplish to download and register on the app. The team designed and wireframed a process to reduce the login four steps down to one step to achieve a simplified login. However, this programming would take several months to accomplish due to other priorities on the prioritization schedule. For a more immediate improvement to the adoption process, the CareValet team opted to promote the $50 wellness visit as an incentive to enrollment if they downloaded the app. While the incentive existed in the benefit plan if the member
satisfied that appointment on their own, the CareValet team presented the wellness visit information as a simplified process if they scheduled the visit through the CareValet platform. It has been determined that additional EADR cycles will continue to improve adoption levels.

5.4 Wrap Up

Since Mullarkey and Hevner (2019, p. 2) determined that, “at the outset that the ADR process must generate design knowledge that creates innovative artifacts and addresses an organizational need for intervention,” the research observed and influenced activities the CareValet team documented from the implementation and adoption results demonstrating rigor through the EADR cycles. These design cycles produced successful platform adoption through the use of the EADR process. The four EADR design cycles influenced adoption levels as they were measured over time. Design Cycle 1 introduced the artifact materials used to prepare the SGCG members to enroll (adopt) on the CareValet platform. Design Cycle 2 established the first opportunity for SGCG members to enroll on the CareValet platform. In January, the plan achieved a 2% adoption rate, which did not meet the threshold enrollment level. As such, additional design cycles were required. Design Cycle 3 consisted of the design team attending an on-site open enrollment in which a pivot was established to solve a date of birth log on issue. This resulted in an increase in enrollment to 19%, which achieved the threshold. However, the team established that some additional nudges would produce greater increases in enrollment and Design Cycle 4 was established. The result produced a 33% enrollment in the short-term and a 45% enrollment in the long-term.

Using a design science approach, the artifacts introduced in each cycle were able to improve the adoption results in each iterative cycle. These design cycle iterations produced the
first measurement metric (adoption) in our assimilation gap study. The importance of this first measurement of adoption allows the research to make important comparisons against the use measures studied in Chapter 6. An interesting finding in the adoption iterative cycles appears when eligible SGCG members of the platform are compared against the SGCG members who enroll on the platform. The data presents a narrowing effect in these two metrics demonstrating that there is stakeholder value.

![Adoption Assimilation Gap](image)

**Figure 27. Adoption Assimilation Gap**

Taking the five segments of the Guided Emergent, Iterative Intervention Cycle into account, the research produced several key findings. The adoption levels exceeded the national standard 7% threshold (Umland, 2018). After nine months, at the end of September 2019, the level of adoption was at 45%. While the enrollments were well above expectations, the CareValet team was not satisfied with this level of adoption. They were interested in having a greater impact on the entire population. The team determined they needed to look at traditional and digital nudges to improve this outcome. Adoption of the platform also improved when some of the more outspoken leaders began encouraging enrollment on the platform. Social Norms
Theory defines behavior as being peer influenced and having a strong effect on individual decision making. The CareValet team determined they would begin a CareValet Champions program building a peer driven team leader program that informs the Champion first of a new or impending activity and gets them on board before any release to the general population.

The design cycles uncovered several barriers to adoption that had been noted by the CareValet team. The date of birth requirement in the registration process needed to start at a year that was the average of the population’s age in order to improve the pace of enrollment and adoption. Logging into the web was easier than downloading and registering in the app. Many of the employees use “burner phones,” also known as monthly plan smart phones. The employees with these phones had difficulty gaining access to the Apple App store or the Google Play Store. This was primarily due to them forgetting their logins or never logging into the app stores since they used these phones primarily for phone calls and basic web data. Simplifying the login process and offering alternatives may improve the adoption metric.

Additional observations indicated that while the contract with the client requires that only the network link was allowed to be printed on the ID card, a CareValet provided link, the customer failed to abide by these rules and this effected adoption levels. In the future, the CareValet Account Management Team determined they would be more involved in approving the ID cards before they are released. Research revealed that the registration process on the mobile platform was too lengthy for most users. The team theorized that simplifying the mobile log in process to one or two steps should significantly improve adoption. The CareValet team noticed that having a physical presence with the end users helped promote adoption and created momentum. The other stakeholders, such as the plan administrator and the HR leaders at SGCG, became engaged and optimistic about future outcomes when personalized enrollment materials
were provided and when the CareValet team came on sight to support the physical enrollment of their employees.

While the CareValet team desired to further improve adoption levels, the long-term success of the platform would fully depend upon the platform’s continued use. This philosophy was supported by the Consumer Priorities in Healthcare Survey (Deloitte, 2016, p. 8) when it was documented, “By focusing on what’s most important to consumers, plans can drive better and broader digital adoption and earn the permission space to digitally engage consumers for other reasons (e.g., scheduling, health monitoring, web chat, etc.).” These areas of digital engagement are core to the CareValet platform, and digital nudging is the driver the CareValet Development Team has theorized will lead to the platform’s overall success.
Chapter 6. Use

While research and theories on adoption support registration and first time use on digital platforms, long-term platform success is dependent on use or ongoing platform engagement. Failure to obtain long-term use may result in de-adoption or platform apathy that can ultimately lead to platform failure. Prior research has shown the while platform adoption may occur with a particular stakeholder; platform use may not follow. To better understand what influencing value use has, we study the assimilation gap in this platform design. Research has also established that narrowing effects between adoption and increases in use indicate improvement in value, while widening of the assimilation gaps indicates a decrease in value. Frambach and Schillewaert (2002) noted this result about adoption. Following the EADR model, design cycles are created to promote improvements in use. Digital nudges are introduced in the development design cycle as the artifact that is intended to influence improvement in use and demonstrate a narrowing effect in the assimilation gap. While adoption cycles in Chapter 5 were designed to influence what was happening outside the platform through the development of artifacts, the use cycles and resulting artifacts in this chapter are designed to influence activities inside the platform.

6.1 The Problem

As the literature indicates, platform use after adoption is not an easy task to accomplish. This is particularly true when it comes to healthcare. One of the primary reasons, according to metrics provided by Deerwalk, a healthcare data analytics company with millions of points of data, only 56% of health plan participants will use their health plan in the given year.
Synergistically, according to the health plan administrator for the SGCG health plan, their use (i.e., one or more medical visits in the year) is performed by 56% of the eligible primary members.

This research contribution is designed to evaluate use by studying the digital nudging certain influencing actions taken by users within the mobile healthcare platform CareValet. We selected two areas of measurement in the artifact that would have the most significant effect on overall cost exposure to the health plan. There are several supporting documents identified in the literature review. Rau (2014) revealed that the region where the SGCG health plan is located has some of the most expensive costs of healthcare in the U.S. This research theorizes that applying value driven activities to lower, more efficient cost care can reduce cost exposure to the SGCG health plan. With this information, we theorize the two use areas that could have this type of financial impact would be telemedicine and appointment setting.

6.2 Use Metrics

The first focus area addressing use is telemedicine. Improving telemedicine use was significant because it has value to all stakeholders. For the employer/health plan/broker, it has a clear and measurable return on investment (ROI) when engaged. According to Teledoc, one of the leading U.S. telemedicine vendors, when telemedicine is utilized by members of a health plan, these visits eliminate, on average, 60% of primary care office visits, urgent care visits, and ER visits. Each telemedicine visit offsets the average cost of care in each of these settings by $125 for primary care, $175 for urgent care, and $1,200 for ER visits. The average savings per incident for each of these categories is established at $517 per telemedicine event. The resulting savings for an employer based health plan is very significant when use occurs. The potential for
telemedicine savings extends directly to the employees of the SGCG health plan due to their rural setting. In this region of southwest Georgia, there are no urgent care facilities. If an SGCG employee requires immediate care and their physician is unable to see them that day or it is after hours or a weekend, the only option for care is the emergency room. Telemedicine presents the greatest opportunity to offset those costs. The specific value to the SGCG employee is measurable in both the cost of care, as these employees would not have a co-pay, deductible, or out-of-pocket expenses by using telemedicine, and travel time as they wouldn’t have the expense of traveling to see a provider for care. The ROI achieved by increasing telemedicine use can easily meet some of the medical financial goals of the group and would have a positive ROI that exceeds the aggregated cost of the CareValet platform.

Using the EADR model, this research addresses gaps that may improve telemedicine use in a mobile health platform. The greater research contribution is to fill the gaps in knowledge to improve practices for platform development teams in healthcare.

The second area of focus addresses use in appointment setting. Appointment setting became a priority, especially for wellness/preventative visits, since this benefit has the greatest potential to benchmark an individual’s health and identify those individuals at risk for a health event. According to the Centers for Disease Control, health plan members who have a regular annual preventative visit have the greatest opportunity to capture early stage illness or disease. Capturing early stage illnesses or diseases allows providers of care to treat in the earliest stage when treatment options are typically at their lowest cost. The employer/health plan/broker stakeholders should see a reduction in catastrophic claims costs as the preventative/wellness visit is designed to engage the patient with their provider in order to assess and identify their health risk profile. These early intervention practices have proven ROI’s (Goetzel, Tabrizi, Henke,
Benevent, Brockbank, Stinson, Trotter, and Newman (2014). The consumer/employee/patient finds value in these visits because they ensure they are either addressing their health risk or learning whether their behaviors are truly healthy and producing positive health outcomes. The SGCG health plan members also received a $50 gift card for completing their annual preventative visit. This incentive would help the plan and the members achieve their financial and health plan goals.

6.3 Design Cycles

The research utilizes the EADR cycle to gauge the iterative cycles when measuring use. Additionally, we applied nudge theory to determine whether this theory had the ability to influence changes in both telemedicine and appointment setting use. Technology overload contributes to consumer confusion by exceeding an individuals’ cognitive capacity (Benartzi & Learner, 2015; Zahn & Rajamani, 2008). Platform designs must be intuitive to the user for the application to be digestible, as well as have any possibility of success. Choice architecture supports intuitive thinking and promotes simplicity of use in digital environments. The concept of nudging in this environment is based upon the idea that a suggestion, utilizing behavioral methods, can improve human decision making. “Findings in psychology and behavioral economics identify that decisions are heuristics and biases in the design of a choice environment” (Thalar, Sunstein, & Balz, 2013). Platforms designed intuitively and utilizing choice architectures that promote a digital nudge can serve as a decision making guide (Thalar & Sunstein, 2009) that provides guard rails down a well paved road for users. Effectively designed digital nudges can promote non-intrusive decision making pathways that lead individuals to their desired outcome without over engagement that can promote disengagement.
Using this information, we established the following research questions and hypotheses.

**RQ3)** What strategy might best support use improvement in a digital healthcare platform in a rural community?

Hypothesis 1 – Telemedicine Calls: We theorize the CareValet Development Team will improve use by injecting digital nudges to the SGCG group being followed.

Hypothesis 2 – Appointment scheduling: We theorize the CareValet Development Team will improve use by injecting digital nudges to the SGCG group being followed.

**Use Design Cycles**

![Use Design Cycles Diagram]

*Figure 28. Use Design Cycles*

The Use Design Cycles in Figure 28 above follow the development of the delivery system established to promote effective digital nudging and are based upon the supported nudge
research. Design Cycle 1 follows the team strategy for development of the nudge delivery system. Cycle 2 explores the process for building effective SMS and push notifications. Cycle 3 documents the team’s progress on building effective nudge language in each notification type, while Cycle 4 tests the nudges with the use subjects by documenting the use metrics and measuring the assimilation gap.

**Use.** In reviewing nudge theory, we find the primary purposes behind nudges are to maintain freedom of choice, support the natural cognitive framework in the process of decision making, and that a nudge is considered a soft paternalism (Sunstein, 2014). Sunstein (2014) suggests the top 10 nudges one may consider in the process of design.

- The default nudge – this nudge is designed to automatically enroll an individual and would require them to opt out of a program.
- Simplification – this nudge considers simplifying processes so that the end user is not wasting time repeating efforts on other forms or performing linear tasks that reach a desired outcome.
- Use of social norms – encouraging behavior due to the status quo.
- Increases in ease and convenience – making it easy, removing perceived difficulties to access or use.
- Disclosure – offering transparency in order for individuals to make clear and informed decisions.
- Warnings – making significant information prominent to users, especially if there can be a negative outcome when making an uninformed choice.
- Precommitment strategies – if people precommit to a certain strategy, then they are more likely to act toward that strategy or goal.
• Reminders – notification alerts to keep important items at the top of a person’s mind.

• Eliciting implementation intentions – identifying previous behavior (positive or negative) to trigger a person to act.

• Informing people of the nature and consequence of their past choices – Sometimes people will change their behavior and act if they are made aware of data or information that suggests they make an informed decision about a particular event or activity.

Using the EADR cycle to measure outcomes, this research applies nudge theory to the following measurement strategy. To support the use of nudge theory, the researchers, along with the CareValet team, design digital nudges into the CareValet platform. Since digital nudging is the artifact, promotion of its primary action to accelerate utilization and maintain engagement has the possibility to validate the worth among the SGCG population when attempting to improve telemedicine calls and appointment setting.

The literature appears to promote this approach. Digital nudges leverage a user interface design to guide an individual’s behavior in digital choice environments to improve their decision making (Weinmann et al., 2016). Hansen (2016, p. 174) provided this definition:

“A nudge is a function of any attempt at influencing people’s judgment, choice or behavior in a predictable way, that is (1) made possible because of cognitive boundaries, biases, routines and habits in individual and social decision making posing barriers for people to perform rationally in their own self-declared interests and which (2) works by making use of those boundaries, biases, routines and habits as integral parts of such attempts. Thus a nudge amongst other things works independently of: (i) forbidding or
adding any rationally relevant choice options, (ii) changing incentives, whether regarded in terms of time, trouble, social sanctions, economic and so forth, or (iii) the provision of factual information and rational argumentation.”

Nudging functions employing two levels of thinking by Kahneman (2011): System 1 and System 2 thinking. Known as dual process theory, there are variances between biased and rational decision making. Kahneman (2011) calls them System 1 and System 2 thinking. System 1 thinking (biased) is rapid, automatic, and intuitive, while System 2 thinking (rational) is slow, deliberate, and intentional. System 1 thinking incorporates automatic memory recall and perception. System 1 thinking is instinctive and emotional, while System 2 thinking is deliberate and logical. Digital nudging is focused around System 1 thinking.

The research considers the digital design method (Figure 16) in the design cycles when measuring the two digital nudge types. The goal is to demonstrate use improvement contributions within the development of mobile healthcare platforms through the design of digital nudge artifacts. This intervention cycle consists of the following steps presented below: 1) identification of the problem formulation as it effects use within the CareValet platform by asking will the platform use levels meet or exceed 7%, 2) artifact creation where the team will strategize to use the digital nudge design method to build the necessary infrastructure around the CareValet platform, 3) evaluation, as in did the nudge meet the pursued consumer behavior, 4) reflection and nudge improvement options, and 5) Learning and evaluating the perceived value of the nudge.
Table 11. Problem-Centered Design Cycle Model for Nudge Development

<table>
<thead>
<tr>
<th>Design Cycle Model: Problem-Centered Entry Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation of the users and proposed nudge as an influencing factor to platform use</td>
</tr>
<tr>
<td>Problem Formulation</td>
</tr>
<tr>
<td>Did the platform use levels in this strategy meet or exceed 7%</td>
</tr>
<tr>
<td>Artifact Creation</td>
</tr>
<tr>
<td>Digital Nudge Design Method</td>
</tr>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Did Nudge meet pursued Consumer Behavior</td>
</tr>
<tr>
<td>Reflection</td>
</tr>
<tr>
<td>Nudge Improvement Options</td>
</tr>
<tr>
<td>Learning</td>
</tr>
<tr>
<td>Perceived value of Nudge</td>
</tr>
</tbody>
</table>

**Nudge 1 – Telemedicine.** The telemedicine digital nudge design strategy was created to influence an increase in telemedicine use. Using the digital nudge design method we establish the development process.

**Telemedicine digital nudge context.** In concert with the CareValet Development Team, we determine that a feasible technology channel would be a communication administrative portal that uses push notifications, SMS, and email notifications. This design supports the existing CareValet platform and allows for simple and direct communication with the users. The specific goals in this strategy frame repeatable and reusable processes that allow the CareValet team to send notifications to any of their consumer users or group in order to promote system use goals.

Utilizing research to establish primary user behavior goals ensures the notification triggers System 1 thinking (Kahneman, 2011) with the intention of having the user take immediate action. The nudge is intended to trigger either an emotional response or an incentive-based reaction. To do so, the KPI (Key Performance Indicators) to be measured are: 1) the number of users the notification is sent to, 2) the number of users who took action by calling a
telemedicine provider, and 3) the percentage of telemedicine calls compared to historic months. Since we know the SGCG group is in a rural area and there have been no mobile healthcare technologies presented to this population, we assume that leveraging known mobile messaging systems will support an ease of decision making.

**Telemedicine digital nudge ideation and design.** The digital nudging principle is designed around creating user ease and convenience. Today, members of the SGCG health plan must go to an emergency room as a first option for immediate care if it is after hours or if their provider is unavailable to see them. Telemedicine has proven to create a level of ease and convenience needed when users require immediate care. The research supports the idea that a telemedicine digital nudge needs to: 1) be a short and simple message, 2) present an incentive, and 3) provide a one touch link to the telemedicine providers phone number.

**Telemedicine digital nudge implementation.** The CareValet Development Team will create an administrative portal to enable the notification system. This technology channel is scheduled to launch in July 2019. After the administrative portal is created, the CareValet team will launch the first telemedicine nudge in early August.

**Telemedicine digital nudge evaluation.** The research value measures are reviewed through the established KPI’s and by observing user behavior compared to the intended behavioral goals. A primary observation is to determine whether the notification (nudge) triggers a System 1 response and elicits a telemedicine call.

**Nudge 2 – Appointment setting.** The appointment setting digital nudge design strategy is created to influence an increase in use of the number of annual preventative visits. Earlier in this chapter, we demonstrated the financial value of improving the number of appointments for
annual preventative visits. Once again, for appointment setting, we will use the digital nudge
design method in the development process.

**Appointment digital nudge context.** Not unlike the telemedicine notification design, the
team believes an administrative portal that uses push notifications, SMS, and email notifications
will promote appointment setting. As with telemedicine, this design supports the existing
CareValet platform allowing for simple and direct communication with the users. As an
organization, the CareValet team believes the value of the notification portal has larger scale
value to all customers and users by allowing for notifications for any type of communication
with their customers and stakeholders in the system.

The goal of simplifying a user’s ability to schedule an appointment through a simple push
notification is designed to support simplified user actions and, once again, promote System 1
thinking. KPI’s to be measured include: 1) the number of users notification is sent to, 2) the
number of users who took action by scheduling an appointment with their provider, and 3) the
percentage of appointments compared to historic months. Electronic appointment setting is an
unknown process and is presently not available for the SGCG group. These electronic
capabilities would be new to this user population.

**Appointment Digital Nudge Ideation and Design.** The primary digital nudge principle
established for the appointment setting nudge is to create ease and convenience for the SGCG
members. The current standard process for appointment setting available among SGCG health
plan members requires them to look up a provider on a website and make a phone call to make
an appointment. As a result, this process requires users spend valuable time attempting to get a
provider on the phone and find a mutually agreeable time for the visit. This new appointment
setting design process is intended to bring the time the users spend to set an appointment into a
much more efficient process. It is theorized that appointment setting will create a level of ease and convenience that supports the nudge principle.

Since the digital nudge artifact is focused around similar principles as the telemedicine digital nudge, its process development will be similar in design. The priorities consist of: 1) a short and simple message, 2) present an incentive, and 3) provide a one touch link to the provider appointment setting artifact in the CareValet platform.

*Appointment digital nudge implementation.* Following the same design as the telemedicine digital nudge, the CareValet Development Team established a plan to create the administrative portal to enable the notification system. This technology channel is scheduled to launch in July 2019. After the administrative portal is created, the CareValet team will launch the first appointment nudge in early August.

*Appointment digital nudge evaluation.* The research value will be measured by reviewing the established KPI’s and by observing user behavior compared to the intended outcome goals. A primary observation is to determine whether the notification (nudge) triggers a System 1 response resulting in an appointment being set with their provider.

### 6.4 Implement

Both the telemedicine and appointment setting processes require similar nudge development. The following cycles reflect the EADR development process for both processes.
Table 12. Nudge Design Cycle 1

<table>
<thead>
<tr>
<th>Problem Formulation</th>
<th>Evaluation of the administrative portal to distribute digital nudges to improve platform use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artifact Creation</td>
<td>Design administrative portal that allows CareValet operations team to design and deliver nudges</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Did portal support operations ability to deliver nudges</td>
</tr>
<tr>
<td>Reflection</td>
<td>Portal improvement options</td>
</tr>
<tr>
<td>Learning</td>
<td>Establish plan to schedule nudges on a timeline</td>
</tr>
</tbody>
</table>

**Cycle 1.** In the first EADR cycle of development, the problem resolved is the creation of an administrative portal. This portal establishes the ability to send out digital nudges to the SGCG members. These nudges are delivered with the intent to affect the larger scale goal of achieving user activity levels of greater than 7% in both the telemedicine and appointment setting nudges. In the formation of the administrative portal, we guide the CareValet Development Team to build the artifact so it can be supported by the CareValet Operations Team. This is to ensure the greatest level of operational efficiency can be promoted in the process and prevent any long-term use of the very expensive computer programming talent in operational processes.

In order to distribute digital nudges effectively, the CareValet Development Team evaluated the CareValet administration web portal. Much of the backend infrastructure existed to support digital nudge development. The team established the initial design and began programming. The team linked the client level profiles, as well as the individual user level profile, so the operations team is able send notifications either in group form or to individual users. In the evaluation phase of the cycle, the operation team can see a portal that would allow
them to send out digital notifications to groups and users. This is designed with the intent to promote outcomes leading to greater use levels.

A reflection on the development of the portal produced an item that was missed in development. The team learned there was no ability to schedule digital notifications. This is important in future development stages so the operations team can plan delivery of digital nudges instead of just releasing them on demand. With the portal complete in this cycle, the development team considered the next stage of development and formulated a process focused on different types of nudges that promote use messaging.

Table 13. Nudge Design Cycle 2

<table>
<thead>
<tr>
<th>Design Cycle 2: Problem-Centered Entry Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Formulation</td>
</tr>
<tr>
<td>Evaluation and specification of nudge types</td>
</tr>
<tr>
<td>Artifact Creation</td>
</tr>
<tr>
<td>Establish digital nudges in push notification form, SMS and email</td>
</tr>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Evaluate function on all tech platforms (iOS, Android, email)</td>
</tr>
<tr>
<td>Reflection</td>
</tr>
<tr>
<td>Establish all nudges are delivered in each platform</td>
</tr>
<tr>
<td>Learning</td>
</tr>
<tr>
<td>Create nudge history repository by group and user to ensure repeat info is not distributed</td>
</tr>
</tbody>
</table>

**Cycle 2.** In the second EADR cycle, the problem formulation establishes specific nudges that are designed in the administrative portal and delivered to the users via the CareValet platform. This cycle considers the literature supporting positive adoption outcomes through nudging, as well as the effectiveness for the nudge to close the assimilation gap. In order to achieve effective digital nudges, two forms of nudge are created for the portal. The digital nudges formulated are push notifications and SMS (Short Message Service). The first nudge
type, a push notification, is a notification that appears on the mobile device as an alert to a user who has downloaded the CareValet application. The push notification is a call to action that requires an action on the user’s part to implement the activity associated with the nudge. The second nudge is a SMS notification. The SMS allows text only messaging from a system or mobile device to another user’s device by utilizing cellular data networks. After the CareValet Development Team created each digital nudge, they assessed the output of each nudge. After the evaluation of the development of each nudge, all nudges worked in iOS and Android. In our reflection, not only were we able to determine that all nudges could be built and sent, but all nudges were received by each device type as well.

As the team contemplated the development of the nudge process, future plans to create a repository of historic nudges would be beneficial to connect reporting values to the nudge output. This would allow the CareValet Operation Team the ability to see what has historically been sent to members in order to prevent replicated nudges and to reuse nudges that are effective. With the completion of the nudge types in Cycle 2, nudge language is contemplated by the team to ensure messaging achieves the use goals as the development moves to Cycle 3.

Table 14. Nudge Design Cycle 3

<table>
<thead>
<tr>
<th>Problem Formulation</th>
<th>Evaluation nudge wording</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artifact Creation</td>
<td>Establish wording and length of digital nudge for both telemedicine nudge and appointment nudge</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Did digital nudge present clearly on apps</td>
</tr>
<tr>
<td>Reflection</td>
<td>Determine if SMS and Push notifications have app link back capabilities</td>
</tr>
<tr>
<td>Learning</td>
<td>Measure link back options prior to deployment</td>
</tr>
</tbody>
</table>
Cycle 3. The third design cycle focuses on wording development for both the telemedicine and appointment setting nudges. To address this development, the CareValet team defined action producing statements for each nudge. Different messages are designed for push notifications and SMS to have the greatest possible outcome. The telemedicine push notification nudge is a simple call to action that states, “At CareValet – the doctor is always in, $0 Copay – tap to login (See Figure 30). The telemedicine SMS nudge states, “CareValet Telehealth always here when you need us! $0 copay. www.carevalet.com.” For the appointment nudge, the team designs a simple call to action. The appointment setting push notification nudge states, “Get your wellness screening and earn $50, tap to login.” The appointment setting SMS nudge states, “Get your wellness screening and earn $50, launch the app or schedule at www.carevalet.com.” These nudges are sent through push notification or SMS depending upon whether the eligible user had already downloaded the platform on their mobile device. Push notifications allow the user to automatically launch the platform by tapping the notification if they already have the platform downloaded. An SMS nudge is sent to users that have not yet downloaded the platform. In evaluating the nudge process and display capabilities, both the push and SMS nudges display appropriately.

Figure 29. Digital Nudge Examples
As the team reflects on the development of the notifications, improvements to the app opening link back options are considered to improve launching the platform. For push notifications, the user would need the platform running in the background of their mobile device for the tap to launch the platform. The SMS would require a hyperlink either embedded or displayed in the notification to simplify the user experience in launching the platform. These design elements will enhance use and allow for improved data sets.

In reflection, the team learned and noted that if the nudge did not immediately launch the platform, there was a potential for the user to drop out of System 1 thinking and lose interest in launching the platform if too many steps were required to achieve either the telemedicine visit or wellness appointment. With the successful development of Cycle 3, the team moved to launching the notification and gathering data in Cycle 4.

<table>
<thead>
<tr>
<th>Design Cycle 4</th>
<th>Problem-Centered Entry Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Formulation</td>
<td>Evaluation of nudge artifact delivery and call to action</td>
</tr>
<tr>
<td>Artifact Creation</td>
<td>Establish measurement systems post nudge delivery</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Did digital nudge elicit responses</td>
</tr>
<tr>
<td>Reflection</td>
<td>User adoption of SMS and Push notifications did not appear to generate a response</td>
</tr>
<tr>
<td>Learning</td>
<td>Besides measuring # of telemedicine call and # of appointment s set, design measurement to see if user opened application and attempted action</td>
</tr>
</tbody>
</table>

**Cycle 4.** The fourth design cycle observes the results of the nudge artifact delivery to determine whether this call to action elicits use action on the part of the SGCG members. The ongoing goal for the telemedicine and appointment setting nudges is to reach or exceed the 7%
use levels and produce valued research contributions toward assimilation gaps. The CareValet team creates a measurement of the use artifact to structure the reporting on each of the nudge outcomes. The structure measures use in telemedicine calls and appointments set after a nudge is delivered to the user. The number of uses would be determined by observing the level of use in the month the nudge is delivered.

The telemedicine and appointment nudges are delivered on August 7, 2019. In the month following the nudges, there are significant increases in telemedicine calls. However, there are no appointments set by the SGCG users. Reflecting on the nudges, it is noted that, historically, users only use the telemedicine service when they are having a health event that requires an immediate intervention. While this is a small population, this nudge produces evidence that the telemedicine nudge has a longer-term effect on the recipients. There is further evidence that there is a latent effect demonstrating this nudge serves as a future reminder to the users. August results produce a spike in use and higher than average telemedicine use levels continue into September. There are no wellness appointments set after the wellness nudge is delivered. Since this nudge is designed as an immediate call to action, it is clear the nudge did not result in influencing use behavior. 

<table>
<thead>
<tr>
<th></th>
<th>Telehealth</th>
<th>Appointments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Feb</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Mar</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Apr</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>May</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Jun</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Jul</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Aug</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Sept</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

Figure 30. Digital Nudge Use Results
More research and future cycles would need to occur to determine why and how an appointment nudge may influence use behavior.

Since there are many questions regarding the effectiveness of the appointment setting digital nudge for the SGCG population, additional design cycles can produce greater information. The team learned that just measuring the use outcome may have created a gap in learning about the user’s behavior and response to the nudge. It is decided that new measurements must be programmed to gather data on user behavior associated with touching the push notification and SMS nudge link when it appears. This allows for a more detailed observation and can lead to greater research defining artifact barriers that dissuade or improve user’s behavior in achieving the use outcome goals.

6.5 Wrap Up

The four EADR design cycles focused around careful and meticulous evaluation of the effectiveness of the artifact as noted in Venable, Pries-Heje, and Baskerville (2012) to influence use and establish commitment or stickiness with the platform users. Each cycle is measured over time to indicate the effect each design cycle has on use. The artifacts developed in this study occur in the platform and are designed to influence user engagement. Using the design science approach, each development cycle is structured to improve upon the prior cycle to produce artifacts that achieve the intended outcome. In this case, artifacts were produced to measure digital nudges and assimilation gaps. Each nudge is designed to have a narrowing effect on the measured assimilation gap in order to produce valuable research data.

Each use design cycle follows the development of a nudge system (the artifact) that promotes use and effective research data. Design Cycle 1 establishes the nudge delivery system.
Cycle 2 builds effective SMS and push notifications. Cycles 3 produces effective nudge language for specific notification types, while Cycle 4 produces use metric results and assimilation gap measurements.

Observing and documenting the activities the CareValet Development Team performed as they moved through the EADR cycle allowed us to document and measure nudge strategies intended to improve platform use. While the telemedicine nudges goals were met, the appointment setting nudge goals were not. It was also observed that there is a history of telemedicine use without the delivery of the nudge. However, measurements indicated that the nudge influenced greater telemedicine use as there was a spike in service in the weeks following the nudge. The results of the platform use for telemedicine visits without the nudges did exceed the 7% use levels and had a greater return on investment value to the shareholders. The telemedicine use data from the SGCG group from the month of implementation, January 2019, until the date of the last month measured, September 2019, is displayed in Figure 30.

There was a total of 32 telemedicine visits in the first nine months since the plan went live. This suggests that roughly 46% of the enrollees to the CareValet platform were influenced by the artifact to engage a telemedicine visit. The savings generated to the health plan equaled $16,544. This amount is significant as it exceeds their investment costs and provides a healthy ROI to the employer.

The CareValet Development Team felt the use of telemedicine was on track. However, the team made a few observations regarding areas that needed improvement.

1. Enrollments (adoption must improve) – While 45% of the SGCG group’s eligible employees are enrolled on the CareValet platform and 46% of those enrolled have used telemedicine, the aggregate impact for the whole plan can still be improved.
Telemedicine utilization for all of the eligible health plan members including dependents is at 27%. The team concluded that utilization works at its best levels when the members register (adoption) on the platform. Thus, greater adoption will improve use and lead to greater ROI.

2. Nudges – The CareValet Development Team listed the digital nudges that are already built into the system. They are:

a. Pop up notifications within the platform – When a member seeks an ER or urgent care visit, the CareValet platform pops up a “call a physician now” reminder to help the patient navigate their health matter.

b. Prominent Icon and Call Physician Button – The CareValet platform has a physician call button prominently placed in the lower center of the primary screen.

While those nudges are achieving positive outcomes and ROI with members that enroll on the platform, the goal is to maximize telemedicine utilization and redirect, on average, 60% of all urgent care and ER visits. The CareValet team determined that these outcomes could improve with some additional digital nudges.

When defining use as a contribution factor to assimilation gaps, the metric considered for use is one unique use event per used in the measurement period. The charts associating adoption to use on look at a one-time use even (i.e., in any use category like telemedicine use or appointment setting use) to ensure the deployment (or engagement) by the health plan member creates a distinctive value assessment. The use events measured in Figure 31 illustrate an accumulation of use events over the measurement period in the same Way adoption is measured as accumulation events over the same timeline.
Figure 31. Use Events
Chapter 7. Discussion

This dissertation follows the elaborated action design research cycles that are rooted in design science research. The research is informed by data measurements and test cycles designed to measure efficiencies and adaptations in the research population. The purpose is to take a real population approach to understand the outcome effects of a mobile healthcare platform on rural health plan recipients. While ADR studies cyclical process development to create and observe informed research, this study’s research focuses specifically on a rural health plan population and their ability to adopt and use a digital healthcare platform. The study demonstrates rigor by employing multiple EADR cycles designed to increase and improve adoption and use.

7.1 Assimilation Gaps

The intent of this research is to determine if a rural health population can benefit from a mobile healthcare platform. This benefit is to reduce healthcare costs and access not only in this rural population, but potentially all rural populations across the U.S. The SGCG member’s actions are studied to determine if the approach to addressing the research questions and the hypotheses translate into the anticipated outcomes. In order to determine whether this artifact has value, our research focuses on the user’s desire to adopt and use the CareValet platform. Improving adoption and use will be the catalyst for these benefits in cost and access. In each EADR cycle, the research injects processes like nudge theory to promote adoption and use. Additionally, each EADR cycle explores the outcome, effects, and benefits that facilitate further contributions to practice and research. Ultimately, the study informs academic research,
consumers, practitioners, such as platform developers designing and successfully growing mobile healthcare platforms, and government entities addressing healthcare policy and accessibility.

The data results produce interesting findings. In measuring the assimilation gap value, from adoption and use, there is a significant narrowing effect after the digital nudge occurred. These results are supported in the Fichman and Kemerer (1999) study that concludes in order to determine the value of information technology and, in our case a digital nudge, the assimilation gap must demonstrate a narrowing effect. Figure 32 illustrates the narrowing effect between adoption and use over the nine-month period. As adoption levels off, the use levels continued to grow. Each use, accumulating over time, demonstrates that digital nudging, when promoted, increases use. Digital nudging effects demonstrate a jump in use in the Figure 32 trend line. The narrowing effect initially appears to present a natural narrowing between the level of adoption and use activities through non-digital nudging. This indicates that the mobile health platform has developed a level of stickiness in our rural population. The introduction of the digital nudge in the use design cycles demonstrates a significant narrowing of the assimilation gap.

The metrics used to calculate adoption consist of a one-time unique adoption by an eligible user. De-adoption and re-adoption are not measurable events within this chart. Use events, as defined in Chapter 6, are measure one time as a unique use event. Additional uses for a different use metric (e.g., an appointment setting use vs. a telemedicine use) do not create a new use measurement. Additional use events are considered use activities and do not contribute to the measurement of assimilation gaps. Using these metrics, adoption and use are measured as accumulating values over the measure time period. This process allows for clear measurement of the narrowing or widening effects of the assimilation gap.
This research also studies assimilation gaps in the development of a mobile healthcare platform in a rural population. Platform metrics for adoption and system use make up the values in the assimilation gap. These metrics were calculated over time to illustrate the narrowing effect of adoption and use on a healthcare platform. To further contribute to the research, we create artifacts to measure the influence of both digital and non-digital nudging and how these factors contribute to our study population’s return on investment value.

Contributing to the literature on assimilation gaps, this research study also measures the ROI effect between the cost of the platform and the use value achieved by each use. The use effect measure that contributes to ROI in our study group is telemedicine use. Figure 33 reports the value achieved in this comparison. Note the investment cost by the client was, on average, $1,280 per month. The telemedicine per unit savings value was $517. By the beginning of the second month (February 2019), the SGCG health plan achieved a positive return on investment. The ROI trend continues through July 2019 when the investment level reached $8,960 and the savings level reached $9,823. After the digital nudge is introduced, savings levels reach $16,544, while the investment levels remain steady at $11,520. This jump in ROI demonstrates the value
of the platform among this population without digital nudging and then the increase in value with digital nudging.

![ROI vs. Cost](image)

**Figure 33. ROI vs. Costs**

Figure 33 illustrates the value associated with the return on investment for the SGCG stakeholders. The linear ROI trend line indicates a consistent rise in ROI for this population. The actual ROI measured month over month displays a consistent, positive financial trend. In January, the trend line dips into the negative due to the initial investment by the group. However, in the second month, the group achieves a positive ROI and that trend continues through our measurement period to September 2019. Of note is the flattening of the trend line in July. While there is an ongoing ROI effect, the amount of savings begins to stabilize. When the digital nudge is introduced in August 2019, the trend line not only exceeds the linear ROI trend line, but has a long-term effect moving into the second month. This is an indicator that carefully placed digital nudges that promote use will stay above the linear trend line preventing a reduction in the average ROI for the population and increasing savings.

### 7.2 Research Implications

As noted in Chapter 1 (i.e., motivation), rural health plans have costs on par with the most affluent areas in the U.S., yet do not have the financial resources or incomes to manage
these costs. The introduction and influence of the artifact demonstrate the possibilities innovative
digital influences can have on rural populations by reducing their cost exposure through guided
consumer experiences. Following the 2016 Kaiser article regarding these out of control costs in
rural Georgia, and the Deloitte (2016) study on healthcare consumer preferences, this research
provides a natural expansion to those research observations and measures digital nudging
influences adoption and use. First, the Kaiser (2016) article recognized a problem with
healthcare costs in southwest rural Georgia, while the Deloitte (2016) study identified
consumers’ priorities that address their healthcare needs. The research questions in this study are
defined to measure adoption and use in the CareValet platform. This platform was specifically
designed to address these consumer priorities and cost exposure concerns. Thus, improving
adoption and use within the platform contributes to the research and defines influencing factors
that improve consumer choices and cost outcomes. Consumer choices are introduced in the form
of telemedicine services with cost outcomes measured in the number of consumer selections
(use) of telemedicine and appointment setting (another use option). This defines the path our
EADR cycles performed to contribute to new methods in practice and research. These methods
inform academic research, practitioners, and policy makers.

7.3 Academic Research

Research in the area of adoption usually combines the measurement of adoption with
system use. This combination of terms creates an opportunity for confusion among researchers
and practitioners who are either studying processes or attempting to practically apply research to
effective product development. This research demonstrates that separating adoption as a
measurement from use could provide an important contribution to practice and research. This
was specifically done to first observe the natural adoption of the platform using traditional non-digital nudges in order to see whether the adoption levels met the hypothesized outcome goals. From a research perspective, this was perceived to be important as Rad et al. (2018) concluded, “actual system use,” which is a dependent variable, recorded the lowest frequency of use in reviewed papers on IS adoption studies due to the complexities involved in measuring this dependent variable and, as such, was avoided by most researchers. They suggested that future research in this domain should use this variable in their IT adoption studies as it is the actual system use that should be measured and studied in current IT adoption studies.

Here is how we addressed the confusion of measurement in the research. Following the recommendation to separate use from adoption, this research study determined that measuring adoption as a standalone measurement from use also had importance. Since most adoption studies combine adoption and use as a single variable, the value of testing different EADR cycles against adoption and use independently could provide new information about how to address each area in development and through independent measurement. If nearly all prior research of adoption included use, then we would have little data on the true value of adoption (i.e., specifically measured as a standalone) of digital platforms. This is not to say that adoption has not been measured. We have few examples of studies that dive into the process of adoption and use in this context, specifically as it relates to mitigation of platform abandonment. Since digital and non-digital nudging was used to promote these two measurements among consumers using a mobile healthcare platform, the research creates a leading conversation in understanding adoption and use in the mobile digital healthcare platform setting, as well as targeted consumer behaviors (e.g., the SGCG members).
7.4 Practice Implications - Healthcare Consumers

According to research on healthcare consumers, their needs are not being addressed by the healthcare industry in a way that has value to them. The industry includes everyone from policy makers to insurance plans, platform developers, and even providers. The Consumer Priorities in Healthcare Survey (Deloitte, 2016) revealed consumer preferences that highlighted these gaps, essentially providing a roadmap for policy makers, platform developers, insurers, and providers to follow. The survey resulted in four import themes defining their desired healthcare experience:

Priority One: Personalization expected via providers.

Priority Two: Economically rational coverage and care choices.

Priority Three: Convenience-driven use of care.

Priority Four: Digitally connected to manage healthcare.

While digital connections to healthcare seemed to rank lowest within the Deloitte (2016) study, it notes there is a lack of present connectedness with digital tools in healthcare when compared to other industries. The findings in the study encourage continued development in this area with the following recommendations:

- (Re)evaluate (don’t reduce) digital spending to create integrated and seamless digital experiences. Plans and other players need to assess whether and how their digital tools are being utilized and which digital tools actually matter for each member segment.

- Focus digital investments on the healthcare interactions that matter most to consumers: provider experience and affordability. By focusing on what’s most important to consumers, plans can drive better and broader digital adoption and earn
the permission space to digitally engage consumers for other reasons (e.g., scheduling, health monitoring, web chat, etc.).

- Leverage digital tools to better support the provider-payer-member engagement model. Emphasize to providers what digital tools and data from the plan they have at their disposal to be more efficient, to be more personal with members, and help them to better manage costs, improve outcomes, and make the payment and reimbursement experience more seamless.

- Use digital to improve members’ experiences to promote better affordability, cost transparency, and network affirmation. This is consistent with what consumers ranked most highly in this survey.

- Update experience and quality measures to track what really matters to consumers. Track the use of digital tools to see what works and compare change over time relative to the provider considerations discussed earlier. And when, and if, success is observed and measured, market it thoroughly to prospective and existing consumers to build awareness.

In order to provide effective research, the value of measurement is defined by tracking the SGCG members who downloaded and used the app. The platform is established to address these consumer priorities as the research focuses on the iterations of nudging in two areas. First, the nudge development process in each EADR cycle is created and designed to positively influence the number of downloads of the platform that specifically improve adoption. In addition, digital nudge processes are created to positively influence use.

The detailed characteristics of the adoption processes consist of getting eligible SGCG members to download the app on their mobile phone, and enter their name, their mobile number,
date of birth, member ID, and email address in order to effectively register. Once the SGCG members have the app downloaded, the features available to them consisted of 24/7/365 telemedicine provider access, their member ID card, their medical network of hospitals and physicians (ranked by cost and/or quality), provider geographic locations and mapping, appointment setting, calendaring of appointments, ride sharing services, and emergency services. These items present multiple opportunities for use experiences within the app. The two use areas that are promoted in the research are telemedicine and appointment setting. These were chosen because they present the greatest cost impact opportunities for the SGCG members and the SGCG health plan.

To provide an effective research study, we examine whether our hypotheses to improve adoption and use are effective. Here, we explain our process to persuade consumers to download and use the app features. We presented printed open enrollment materials and performed face-to-face onsite open enrollment meetings one month prior to the app becoming available for the members to download. This was a first attempt at obtaining the adoption goal of exceeding a 7% adoption rate. We learned that multiple cycles of non-digital nudging would be required to achieve the adoption goals. Additional onsite meetings, payroll stuffers, as well as email blasts, were required to keep enrollment of the app relevant over a period of time. Other barriers were also identified that impacted adoption, such as the date of birth feature starting at 1900 and the length of time to took to obtain someone’s year of birth. Alternative enrollment options were provided to the SGCG members that allowed them to download the app, but finalizing registration on the web. Since several members had trouble getting through the multiple steps of registering on their mobile device, this proved to be a temporary alternative until future programming of the app could be adjusted to correct the problem.
We found that adoption of (i.e., downloading and registering) the mobile platform involved more System 2 thinking. There are multiple required steps to push the member into managing thought processes and the evaluative value of performing the task of registration. While this is not a new contribution to the research, it affects operational efficiency in achieving adoption goals and requires greater effort on the part of the enrollment team that affects their time and increases costs in the form of additional interaction.

We made some discoveries regarding consumer use. Though the EADR cycle, digital nudges were designed to promote the use areas specifically: telemedicine and appointment setting use. We built a framework for promoting the digital nudges in the CareValet administrative portal that could send messages in the form of digital nudges to the SGCG members enrolled on the app and who were eligible for enrollment on the app. The features in the administrative panel that supported digital nudging are SMS and push notifications. These features were chosen because of the opportunity to communicate with registered and unregistered members. Push notifications are exclusive to members registered on the CareValet app. SMS can be sent to any eligible SGCG member if their employer provided a mobile number on their eligibility form.

Digital nudges were sent in only two forms: SMS and push notifications. Digital nudges did not have an immediate impact on either telemedicine or appointment setting when they were released to the SGCG member population. There were three attempts by one member to set an appointment through the app several weeks after the nudge was released, but the provider needed more information and the member did not respond to the request after multiple attempts. As such, no appointment was set. The CareValet team received a phone call from a SGCG member who was in the emergency room. This member learned there would be a three hour wait to see a
doctor and remembered receiving an SMS about telemedicine in the app. Since she did not have it downloaded, the CareValet team was able to get her registered and assist her with getting connected to the telemedicine physician. The doctor called her in a prescription to the local pharmacy. She left the ER and picked up the prescription immediately. She called and thanked the CareValet team a few days later for helping her. This case demonstrated the lasting effect of the digital nudge.

We observe that in healthcare, digital nudging may have a delayed effect in getting consumers to react. We believe one reason may be related to The Health Belief Model. A person’s belief in the threat of illness or disease, along with the person’s belief in the effectiveness of the behavioral change (or treatment), will dictate adoption. This was demonstrated when the patient in the ER had no other alternative but to wait three hours or use the telemedicine feature in the CareValet app. We also recognized that when a digital nudge is sent out for an appointment or telemedicine prompt, there were no immediate requests for telemedicine use or appointments. Our observation is that if the person receiving the nudge is not ill, there is an increased chance they will react to the nudge at a later date. We believe the digital nudges can also have a limited immediate effect due to the Diffusion of Innovations Theory. Mobile healthcare digital platforms are emerging in the marketplace, especially at the consumer level. Not only are these consumer level platforms in healthcare new, but there are “limited standards” and “norms of practice” familiar to consumers in the market place when it comes to digital apps as they are not widely available on a consumer level in any consolidated fashion. We anticipate this will normalize rapidly as the market emerges and we will see a more rapid adoption and interaction with mobile health plan platforms. Overall, there was evidence that
digital and non-digital nudging affected consumer behavior over eight months as we observed steady increases in telemedicine use and a larger improvement in adoption rates.

7.5 Platform Developers

In this study, we create both digital and non-digital nudges and develop them within a platform. We also use EADR cycles to systematically influence the development of the platform to achieve improvements in adoption and use (See Chapter 6). The literature indicates that adoption and use in IS platform development when measured together can provide limited value to successful platform development. As Rad et al. (2018) suggest, more research needs to be done to measure use in platforms. This study intentionally separated adoption from use to identify any relational implications these measurements might have in comparison to one another. As the study progresses, there is an increase in adoption that meets and even exceeds the goals established. While nudge cycles have some success, we found that use of the platform lagged in relational growth to the levels of adoption. Telemedicine use has a greater and more consistent level of growth. However, appointment setting use has no growth through the time period studied. This measurement between the rate of adoption and the differences in the lagging growth of use has significant implications. The additional gap difference between telemedicine use and the lingering appointment setting use is of note since both use processes were exposed to similar digital nudges. This idea is also relayed in the book *Platform Revolution* by Parker et al. (2016). “User commitment and active usage, not sign-ups or acquisitions, are the true indicators of customer adoption” (Parker et al., 2016, p. 310). The implications to gaps between adoption and use and, in greater detail, the difference between adoption and telemedicine use and adoption and appointment setting use are discussed below.
We find that use trails the rate of adoption when designing a healthcare platform for rural populations. Whether that gap in activity is systemic and more broadly applicable to other rural populations is an important future question to answer. By reviewing the data, there is an assimilation gap that occurs at three levels. First, there is a gap between adoption and use. However, when reviewing adoption, we see a gap in telemedicine use and a larger gap in appointment setting use. Fichman and Kemerer (1999) note the importance of understanding why assimilation gaps occur and what can be done to reduce them. This assimilation gap is important from the perspective that telemedicine use in this platform has specific financial benefits to the SGCG members and the health plan. The financial benefit of telemedicine use achieves a positive ROI in the data and meets the goals. Thus, we can conclude that the assimilation gap between the app adoption and telemedicine use has a positive effect. Conversely, if there is a great or growing assimilation gap in use that is not narrowed, there could be increased cost exposure to the health plan or no effect on the fiscal exposure to the health plan. This is the result we find when we compare adoption and appointment setting use. There is no positive ROI and a wide assimilation gap. From a developer’s perspective, focused development designed to reduce assimilation gaps in mobile healthcare platforms can mitigate healthcare claims exposure.

7.6 Policy Implications

This study was triggered, in part, because of the 2016 the Kaiser Family Foundation and the Washington Post article that revealed an area of southwest rural Georgia that was exposed to the most expensive healthcare in the U.S. The fees were so significant they were on par with Vail, Colorado, one of the most affluent areas in the country. The CareValet Development Team
was implementing a consumer based mobile health platform with a South Georgia county
government health plan. Since this group is located in the specific area in South Georgia where
the Kaiser Health News and the Washington Post documented some of the highest costing care
in the U.S, it made them a perfect subject to examine the effects as to how this research and
artifact designs, such as nudging, could affect rural health plan populations.

The literature indicates that healthcare costs are rising and health plans and consumers
are facing cost shifting that drives those dollars to them in the form of larger out-of-pocket costs.
Benefit designs shift much of the cost away from the insurer and place greater responsibility on
employers and, especially, consumers. The Kaiser Family Foundation 2018 Employer Health
Benefits Survey also identified that:

1. healthcare premiums are high and getting higher,
2. the cost of healthcare is outpacing inflation, and
3. a catastrophic health event can leave moderate wage earners in medical debt.

The research reveals that in this rural population, employers in this community and surrounding
communities are affected not only by rising healthcare costs, but also by a lack of care options.
Two hospitals control most of the access to care. There are no urgent care services available and
all emergency and urgent care needs are addressed in a hospital setting. This further drives up the
cost of care and is a major contributor to medical debt in an already poor population. By looking
at the 2018 Kaiser study, we find that rural populations across the U.S. are more effected as there
are limitations to resources. There is a lack of medical services, physicians, transportation, and
immediate care, especially when compared to urban areas. These limitations to access can be
offset.
Taking these research results together and combining them with the CareValet platform, we have implemented these nudges into a real-world system. Let’s examine how we can change the outlook for these underserved populations. The CareValet Platform was introduced to the SGCG health plan and members to offer care alternatives and to provide a guided consumer experience that might fill some of the resource gaps in care, as well as offset some of the rising costs. However, complexities in the design of U.S. healthcare insurance plans and the acquisition of care force consumers to make uniformed treatment decisions. These implications to research indicate that when mobile consumer platforms are adopted, use strategies that simplify the consumer experience, such as telemedicine, have the potential to reduce unnecessary treatment and reduce healthcare costs. We also have demonstrated that health plans (e.g., the South Georgia Country Government Plan) and employers who subsidized mobile healthcare consumer platforms reduce the cost of healthcare for the health plan and reduce the costs associated with consumers’ out-of-pockets costs.
Chapter 8. Conclusions, Contributions, Limitations, and Future Research

8.1 Conclusions

This study was a natural experiment, an empirical study where we observed individuals in a rural area as they were exposed to the CareValet mobile consumer healthcare platform. The processes governing the platform exposed consumers using the application to natural experiments using digital nudging to observe how the subjects would react to suggested forms of use within the platform. The outcomes of the experiments were tracked via the measurements of assimilation gaps and regression data measuring the ROI value. This research makes contributions in four areas. The first contribution is to academic research, healthcare consumers, platform developers, and policymakers.

8.2 Research Contributions

In academic research, we note the necessity to separate the measurement of adoption from use. As the literature has indicated, adoption and use are often combined when measuring platform value or success (Rad et al., 2018). Use is not typically measured as a standalone. As such, there is limited literature referencing the value of use after adoption is achieved in IS platforms. This study separates the measurement of adoption from use and introduces digital nudging as an influencing factor to drive system use. Through this separation, we are able to measure the differences between adoption and the measurement of use influenced by digital nudges. The rural population we measured and followed helps to illustrate the value of using an elaborated action design research process to promote digital and non-digital nudging in an effort
to achieve above average outcomes in adoption and use. Nudging is proven, in our study, to enhance the adoption of the platform by following strategies developed in each EADR cycle in Chapter 5. We further demonstrate that digital nudging significantly influences use patterns and achieves improvement in ROI outcomes. These outcomes are demonstrated by measuring assimilation gaps. We find that the narrowing effect of the assimilation gap between adoption and use produces positive ROI outcomes for the stakeholders.

**Healthcare consumers.** For healthcare consumers, we note that intervention is required to influence outcomes that achieve and exceed the study’s goals. Those interventions, digital and non-digital nudges, produced outcomes in both adoption and use. Since the CareValet platform is considered a new industry innovation, as are all healthcare consumer facing platforms, non-digital nudging presents the greatest impact in demonstrating improved adoption rates. Non-digital nudging demonstrates the greatest value, as opposed to digital nudging, primarily because the health plan did not have the consumers’ mobile phone numbers. Non-digital nudging exposed members to the value of the platform in order to get them to download the app in the adoption phase, while digital nudging can be used to promote use activities. When introducing the population to digital nudging, we determine that healthcare digital nudges have a lasting effect. Digital nudges successfully promote telemedicine use. However, further research regarding appointment setting use should be explored. This is the first time a platform service was made available to these consumers. One interesting observation concerning the telemedicine nudge is that even though this type of service is new to the consumer, the data reveals a 60-day lasting effect to the nudge resulting in higher than average telemedicine use. This allows us to conclude that digital nudges have strong influencing ability. We also note that the digital nudge for telemedicine only requires the member to take one step in order to activate a phone call with a
physician. This makes access to doctor a very simple process to accomplish. We also conclude that these one-step processes create a convenience factor for the consumer that is synonymous with Kahneman’s (2011) System 1 thinking.

The other nudge promoting use, appointment setting, requires multiple steps in order for the member to schedule an appointment with a physician. We see no user engagement, both before and after the digital nudge is introduced. Since only one digital nudge cycle is performed in this study, we feel multiple cycles can inform the research in a more thorough capacity. We do conclude, however, that our data indicates that one step digital nudges achieve greater use outcomes and improve consumer engagement.

### 8.3. Contributions to Practice

**Platform developers.** For platform developers in the healthcare consumer innovation space, our findings and the research literature promote an important value in the method of measuring and evaluating successful tracking in adoption and use. In our study, we identify platform adoption as the registration and download of these consumer facing applications. Our study dictates that use be measured from the point a consumer uses a function or feature that promotes measurable use value within the application that they've downloaded. We strongly encourage the use of assimilation gap measurements to identify the value of use in consumer healthcare platform development. Measuring the gaps from the point of adoption to each use function allows the development team to communicate value within the use function or feature being measured. The graphics in Chapter 7 illustrate the assimilation gap between adoption and each use function or feature. This is a solid way to communicate platform value and stickiness over time. Adding a return on investment value point to the assimilation gap chart demonstrates
additional value within platforms and this research. We recommend setting a point on the graphic to demonstrate this platform value. This can be done as an average in the overall graphic or can be specifically graphed to measure the success for each use point.

Why is this an important contribution to the research and platform development? Adding return on investment into the assimilation gap graphic communicates a great level of importance in narrowing the adoption use gap. Fichman and Kemerer (1999), who note the gap between adoption and use, have a point of effect where it must narrow between these values to show benefit. In our study, we specifically use this illustration to demonstrate the benefit to the customer and other stakeholders and add the ROI value metric for use. Therefore, it is important to note that there should always be ongoing activities (e.g., such as EADR cycles) that focus on narrowing the assimilation gap between adoption and the use features within a healthcare platform.

Policy makers. For policy makers, we have proven that mobile healthcare consumer platforms have a great ability to reduce the cost of healthcare, especially in rural populations. Access to healthcare in rural areas is very limited. As such, opportunities to increase access for consumers by leveraging healthcare platforms and their services was demonstrated through the nudged telemedicine offering. These alternative provider access services have a strong ability to reduce overall health plan costs for employers and consumers alike. Some states have legislated limited telemedicine access. For example, Georgia limits telemedicine providers by restricting them to writing a maximum three day prescription. The patient then needs to physically see a physician if they require additional medication beyond the three day period. This is a primary example of how impractical some policies are for rural communities. Since antibiotics normally come in five to ten day supplies, Georgia providers are restricted legislatively to write a
prescription beyond that period of time. This forces the rural patient to seek costly emergency or urgent care services and these legislative policies can even have cost effects on urban patients if their illness presents itself after hours or on the weekend when doctors’ offices are closed. Policies like these increase overall healthcare costs and increase co-payments to the patient.

Rural communities also face resource gaps. In southwest Georgia where our study population resides, there are three specific challenges to access of care:

1. limited primary care physicians,

2. no low cost care access after hours or weekends, and

3. distance challenges (transportation and access).

With limited primary care physicians, these providers are usually fully booked making it difficult for patients to see them on an as needed basis. As such, the only option is for patients to seek care at an urgent care facility. This is a challenge in our population and many rural communities since there are no urgent care options in the area. This forces the patient to seek care at the most expensive option, the emergency room. Many times these visits are not considered emergencies. A cold or even the flu are not considered emergencies unless they are life threatening. This forces an expensive $200 co-payment to a non-emergency ER visit that introduces additional out-of-pocket costs to the patient. In addition to the high cost of care, getting to the emergency room can mean a 30-60 mile ride for some members. Public transportation in limited or non-existent in this region and there is one Uber driver for the entire community. These rural proximity challenges are not shared by their more urban counter parts as the volume of providers is much greater in urban areas as are the transportation options.

Many public policies are focused around larger medical claims expenses. Chronic and catastrophic care usually dictate policy. However, basic illness treatment left untreated becomes
exacerbated and can develop into serious health conditions and increase care costs. This puts an unnecessary strain on the care system, puts the patient at greater and unnecessary health risk, and increases the cost of care to health plans and consumers. Consumer based mobile health platforms that leverage lower costs and easy access treatment options reduce both risk and costs. Policy makers need to elevate these considerations to the top of the list when crafting legislation.

8.4 Research

**RQ1 – How adoptable is the CareValet platform in a rural population?** The research measures the four EADR cycles designed to answer the research question and promote adoption. Following the EADR cycle, the research presents a problem-centered approach to measure and address the CareValet Development Team’s goals. This step in the cycle became the entry point of the research. The first cycle introduced traditional non-digital nudges to influence platform adoption and enrollment (e.g., promotional flyers, slide presentations, marketing videos, and swag) to the eligible employees (i.e., stakeholders). These artifacts drive enrollment from outside the platform. This research is influenced by the importance of System 1 thinking (Kahneman, 2011) and creates strategies to improve the enrollment experience. Iterations in the design cycles prove to provide value and promote pivots when adoption levels become stagnant. In our study, each EADR design cycle produces new artifacts that influence adoption outcomes.

**RQ2 - What strategies most promoted the adoption of a consumer healthcare platform in this microcosm of the population?** As discussed in RQ1, the strategy that became most prevalent in the research was nudge theory. During the EADR cycles that promote improvement on the adoption levels, nudge theory and, specifically, the Digital Nudges Design Method (See Figure 29) promote a structure that leads to improvements in the process to
accelerate adoption. In RQ1, it was hypothesized that programming and process decisions would improve the adoption rates. Within this rural population and through the use of this theory, we find that to be effective and true. The EADR cycles that injected both digital and non-digital nudging (i.e., the artifacts) proved to have a strong effect on adoption outcomes.

The nudge theory that most supports adoption is simplification theory. This nudge considers simplifying processes so the end user is not wasting time repeating efforts on other forms of linear tasks to reach a desired outcome (Sunstein, 2014).

RQ3 - What strategies might best support use improvement in a digital healthcare platform in a rural community? It was hypothesized that when using the simplification nudges theory, both telemedicine and appointment setting would improve use. The literature reveals that failure to obtain long-term use may result in platform apathy, which can ultimately lead to platform failure (Frambach & Schillewaert, 2002). Measuring the value of digital nudging to support use in both the telemedicine and appointment setting features in the platform defined the hypothesis. This measurement promotes a contribution to the research by identifying whether use of digital nudge theory in this population combats platform apathy and improves use and use values. The use values are identified as savings increases the use effect would have on health plans and consumer costs as defined in Chapter 6 for telemedicine and for appointment setting.

The EADR cycles support a contribution to practice through analyzing the steps executed in the artifact development as centered around increasing use. Each intervention cycle consisted of a problem-centered entry point as defined in Chapter 4, Figure 8 (Mullarkey & Hevner, 2019). Each of the four cycles address the implementation process the CareValet Development Team took to create and support the digital nudge process within the platform. The use design cycles address the design and building of artifacts within the system.
The first cycle identifies the need to develop an administrative portal that allowed the CareValet Operations Team the ability to design digital nudges. The second cycle identified the type of digital nudges that would be most useful. The CareValet Development Team deployed three nudge types: 1) push notifications, 2) SMS, and 3) email nudges. The third cycle focused on nudge wording. The wording considered the value of System 1 thinking (Kahneman, 2011) with the goal of eliciting an immediate and emotional response that would trigger the recipient into an action that resulted in a telemedicine call or the appointment setting use event. The fourth cycle identified the need for future development that would measure when and how the recipients of the nudges opened and responded to the digital nudge. The present form of measurement for the digital nudge is to identify the difference in telemedicine and appointment use prior to the nudges being delivered compared to the use after the nudge is delivered. We suggested a better value would be to identify the number of nudges that were opened upon receipt and then measure whether an action was taken. There was a possibility of disparity with telemedicine use measures because a recipient may not have an immediate need for a telemedicine call at the time the nudge is delivered. Thus, those recipients would have no need to take action at that time. This would result in no change in data in the pre- and post-nudge measurements. However, if there existed the ability to measure whether the nudges were opened and read, could produce valuable information.

Overall, addressing these research questions within this study produced contributions in artifact development in EADR design cycles, new measurement values in assimilation gaps, recommendations for policy makers, and process considerations for platform developers.
8.5 Limitations

Since this was a natural experiment and not a controlled study, we are unable to definitively conclude that the results identified in this study will translate to other rural populations. The literature clearly identifies healthcare access and treatment challenges in rural areas, as well as consumers’ desire for better levels of access to providers in digital platforms. This study, however, was limited in scope and size. The specific study findings and translations of the population could be broadened. For example, we were unable to extrapolate all of the details associated with digital nudging in the population. More questions should be asked in the form of surveys and interviews to explore specific answers that can provide details to enhance the research in this subject area.

The study used EADR cycles to improve platform adoption and that goal was achieved as noted in Chapter 5. The limitations came when the EADR cycle was used to build the process for measuring use. While the task was completed, the research only had one attempt at measuring digital nudges that were specific to telemedicine and appointment setting to value use. These results neither validated nor invalidated the hypothesis for use.

There were other process limitations during the study of adoption. During the original open enrollment, eligible SGCG members had to download the app on their mobile phone by entering their name, their mobile number, their date of birth, member ID, and email address in order to effectively register. While a seemingly a simple process, many members initially dropped out of the registration process. We learned that some members had pay by month phones and did not have Apple or Google Play Store access (or couldn’t remember their login information), while others could not remember their member ID and some could only connect over Wi-Fi as they did not have enough data. These were some unanticipated, but learned
barriers that were addressed in the EADR cycles and resolved. Additional EADR cycles specifically focused around adoption could have allowed for obtaining greater detail to better understand whether there was a point where the successful non-digital nudging strategy could transition into a digital nudging strategy. Since the time limitations of the study were restricted to one EADR telemedicine and appointment setting use cycle, additional experiments could reveal better short- and long-term effects of digital nudging in mobile healthcare platforms.

Platforms have two-sided network effects consisting of consumers and producers. In this study, only one side of the network is observed, the consumer. The producer side in healthcare platforms are providers. Observing their behavior and influences within a healthcare platform could reveal opportunities to identify best practices and communication methods, among many other research criteria, in the two-sided network effect model.

8.6 Future Research

Even though the SGCG population was small in size and limited to a region of southwest Georgia, the study expands the conversation in relationship to the Rad et al., (2018) study on information technology adoption. More studies on use could have the ability to reveal many factors. Specifically, measuring a platform’s short-term value and long-term stickiness could be helpful to the information sciences.

Future research would be beneficial in studying digital nudging in multiple cycles of mobile healthcare platform development. This CareValet platform would certainly benefit from additional cycles. We observed the overall effect of SMS and push notifications, but did not measure them separately. This distinction would lend value in determining how these types of
nudges differ in motivating the recipients into action. As an example, what percentage of the recipients open the message vs. the percentage that take action on the message.

The broader healthcare industry still has not achieved a critical mass level of consumer participation. We have learned that the SGCG health plan is on target with the national average when it comes to the percentage of patients that use their health plan. Only 56% of the U.S. population ever uses their health plan. This suggests that, on average, only 56% of the members of a health plan ever have one medical visit within a year. Would adoptable mobile healthcare platforms change that metric? How would digital nudging in the platform support improved health plan use?

Further exploration into assimilation gaps can also provide value. Considering the multi-level assimilation gap in Figure 34 below, we have the potential to solve multiple use factors and measure the narrowing and/or widening effect of each use. The blue line in the graph represents the number of health plan members who adopted the platform. This is the baseline or first level metric in our assimilation gap measurement. It is the measurement that the use levels will be compared against. The orange line is the first level of use measure. In this case and in our study, this orange line represents telemedicine use. In a traditional assimilation gap, this two-level metric demonstrated what the narrowing effect is measured against. Proposed in this paper, but not able to be demonstrated, was a third level metric. In our graph, this third level is demonstrated as another use value, appointment setting. By studying multi-level assimilation gaps, we are able to quantify the value of a platform that has multiple use levels. Measuring each unique adoption event and then measuring each unique first-time use event over time allows for assimilation gaps measurements for each individual use activity. These measurements allow platform developers to assess the value of each use metric and determine which uses are most
used or valued by the end user. Observation of narrowing and widening effects allows for assessment and attention accepted or rejected uses. This has implications for various levels of stakeholders. This model also provides an opportunity to compare nudge effects as they are implemented for different uses. Stakeholders are able to compare the effectiveness of each nudge for each type of use. The multi-level assimilation gap model presents a multi-level processes tool that can translate to multiple business and product development models.

![Multi-Level Assimilation Gap](image)

**Figure 34. Multi-Level Assimilation Gap**

This study also measures the nudge effect associated with use value. In speculating the use effect of a multi-level assimilation gap, we can also conjecture that nudges not only influence the narrowing effect of assimilation gaps, but can also promote comparative values among each level of use. Some use levels may respond particularly well to a nudge, while other use values may not. Utilizing design science research methods, like action design research cycles, can provide tools to study and align processes that trigger a narrowing effect of each individual use level. These areas would benefit from future research, especially in consumer healthcare platforms, as these platforms have not yet achieved broad adoption in the market.
References


Appendix

Near Soft Kick Off Canvas

**PROJECT GOAL:** What is the project scope based on the first meeting info? Make Care Valet more intuitive. Validate user workflow and fix usability issues to improve current UI.

**PROCESS:** What part of our Scale Up process will meet the project requirements?

- **Run Usability Testing**
- **Interpret Feedback**
- **Test Prototype**
- **Improve Workflow**
- **Design Standards & High Fidelity Mocks**
- **Styleguide**
- **Build iOS & Android**

**METHODOLOGY:** What is the client framework to collaborate?

- Design Sprints

**TEAM:** Who will be working in the project?

- Nearsoft UX Team
- Lead UX-er

**TIMEFRAME:** How much time do we need?

- 9 weeks

**CHECKPOINTS:** What deliverables is the client expecting?

- Feedback findings session, Interaction workflow map (wireframes), HF Mocks, Zeplin Styleguide

**ASSETS:**

- iOS, Android, Desktop

**PROGRESS:**

- Daily
- 2000 EST

**COMMUNICATION CHANNEL:**

- Skype, hangout, and email

**USER RECRUITMENT:** Who will be recruiting the users?

- 12 current users done by CareValet

**CLIENT RELATIONSHIP:** What are the client expectations of the project?

- 50% initial payment followed by weekly invoices as the project progresses.

**STAKEHOLDERS:** Who will be our direct contact?

- CIO

**ADDITIONAL COMMENTS:**

- Skvoe: Email:
Figure 4. Types of human thinking.