

MASTER THESIS

SPRING 2013

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Abstract

Preface

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Trondheim, Dec 18, 2012 - Kent Robin Haugen

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Abbreviations and Acronyms

AI	Artificial Intelligence
API	Application Programming Interface
GPS	Global Positioning System
NLP	Natural Language Processing
RSS	Rich Site Summary
SMS	Short Message Service
UI	User Interface

Part I

Introduction

Chapter 1

Introduction

1.1 Problem

State that it's not in my assignment to evaluate recommendation techniques, but that I use a backend system for that part. My task is the client part in figure 1.1

Explain briefly how my problem evolves around an intersection of a mobile application, news application and a recommender system.

1.1.1 Research questions

GIVE A PERSONAL INTERPRETATION ON THE RESEARCH QUESTIONS

- What are possible perspectives on news in a personalized news recommender system and how are they related? (logical structure of news: articles, maps, entities, categories,...) ... should come up with a model to show how different aspects of news are related.

(Create some figure to show how they are related, like a pin on a map with title corresponds to the name of the place in the title for instance. Or an entity like Madrugada in an entity view, can correspond to a word (Madrugada) in a text about Sivert Hyem)

- What are particular features of mobile user interfaces that affect the mobile news user experience? (platform stuff)

(Touch gestures plays a significant role when designing a mobile app, save space wherever you can -*i*, gestures instead of buttons, make more screens with less info instead of cluttering the screen. Only one domain per screen, type of. E.g. in this case separate map and article view.)

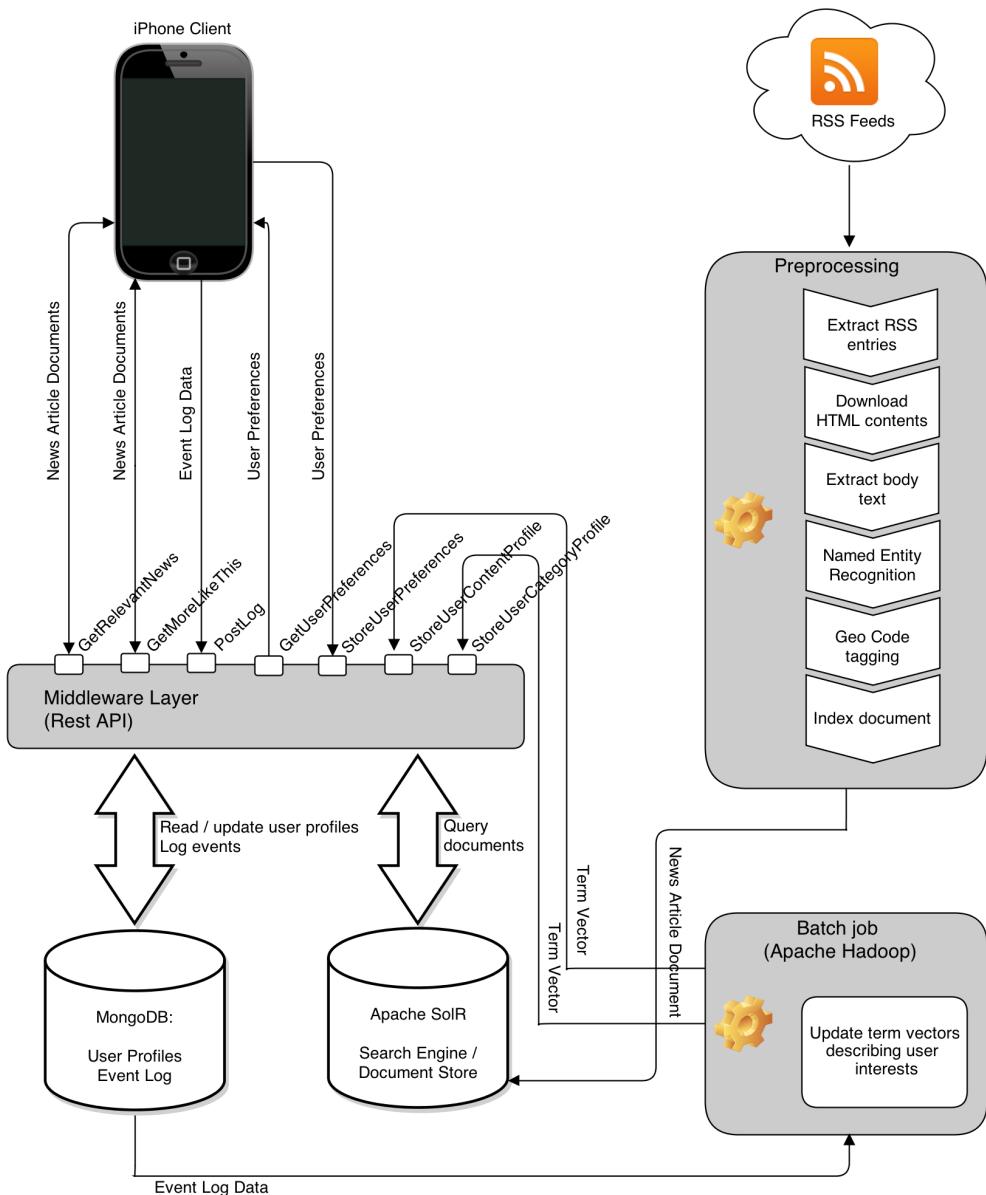


Figure 1.1: Conceptual drawing showing the architectural view of the whole news recommender system.

Unable to hover with the mouse)

- What are relevant perspectives on news in current mobile news apps? (what do they address, and how do they implement it)

(Most apps combine categories and entities. Often the user can choose from different high level ordered categories like technology or economics, but can search for other categories and entities as well, and add these with the same hierarchical significance as the other news categories. Topics/entities can be flowers, BMW, Chelsea, cycling, etc.. Anything the user finds interesting.)

- How can these perspective be supported on a mobile platform to increase user experience and provide maximum flexibility? (gestures vs. input, flow between related perspectives like article & map location, etc.) here we should show how we translate the model above into particular user interface features.

- User case: Our news recommender system

1.2 Research Approach

overall research approach

1.2.1 Introduction

- short text describing the different research strategies

1.2.2 Methodology

- What kind of methodology will I be using (Design-science ?)

1.2.3 Overall Research Phases

- Describe the different phases in my research

- Typisk: check out similar projects/articles -*i* relate to my project -*i* implement an demo application -*i* evaluate the whole shabang!

1.3 Results

1.4 Report Structure

Chapter 2: Lorem

Chapter 3: Lorem

Part II

Theoretical Background

Chapter 2

Theoretical Overview

2.1 Mobile User Interfaces

How are they different from PC UI? (examples)

2.2 News Applications

Both PC and mobile apps

What do they present?

2.3 Recommender Systems

Definition: According to Cylogy, personalization is "the process of deciding - given a large set of possible choices - what has the highest value to an individual" [7].

Practical Use

Chapter 3

Related Work

In the ever expanding universe of information and the information overload that follows with it, the work on dealing with this overload never sleeps. This chapter will look at work done on handling information overload, especially considering news consumption, and news consumption on mobile devices. Topics like personalization, mobile news applications and news applications in general, designing mobile news applications and information aggregation will be discussed in more detail.

3.1 Personalization on mobile devices

Mobile Recommender Systems by Francesco Ricci

3.2 Personalization regarding news apps

User modeling for adaptive news access by Daniel Billsus and Michael J. Pazzani

ePaper - the Personalized Mobile Newspaper by Shapira, Shoval, Meyer, Tractinsky, Mimran

Aggregated Cross-Media News Visualization and Personalization by Cyril Rohr, Dian Tjondronegoro

The Future of Personalization at News Websites - Lessons from a longitudinal study by Neil Thurman, Steve Schiffers

3.2.1 Content Filtering

3.2.2 Collaborative Filtering

3.3 News consumption

How News Consumption is Shifting to the Personalized Social News Stream
by Vadim Lavrusik

3.4 UI Design mobile news applications

News Sync: Three Reasons to Visualize News Better by V.G. Vinod

Designing the future of the newspaper by Anna Benckert van de Boel

3.5 Commercial news recommendation applications

There are a lot of different commercial news recommendation applications, and because of them being commercial, getting the information on how the applications solves information overload and personalization, can be quite tricky. Some of them have a rather good explanation on how it is done, but most of them keep their cards close to the chest.

Following are a short description of ten of the most popular and well known mobile news applications that are available at this time of writing, subjecting both the UI and how the recommendation is solved, if obtainable.

3.5.1 Zite

Zite is an intelligent magazine, which aims to guide the user towards discovering interesting things to read[8], according to themselves.

User Interface Design

The Zite application meets the user with an infinite vertical scrollable view consisting of the top stories. Each news story is framed within a rectangular tile, whereas each tile consists of at least a title and the publisher of the article. The tile can also include tags, lead text, the time since it was published and the article's image (see the first image in figure 3.1).

From the top stories the user has several choices. In the top left corner the user can access his "quicklist" of categories and entities (see the last picture in figure 3.1). In the top right corner the user can search for topics like music or entities like Rolling Stones. These search results can be added to the "quicklist" to access them later. If an article is tapped, that article is showed in a new view (middle picture in figure 3.1). Here the user can read the Zite's version of the article or open the publisher's version. The user can share the article through numerous social websites and services. The article can be rated with thumbs up or thumbs down buttons. The user also has the ability to change the text size of the article or block the publisher of the article to never get another article from this publisher from this screen.

Zite has a clean and simple UI design with a minimum of surprises regarding navigation. All is more or less straight forward, with an exception of the swipe left on the main screen to trigger the next element on the "quicklist", which might come as a surprise to the common user.

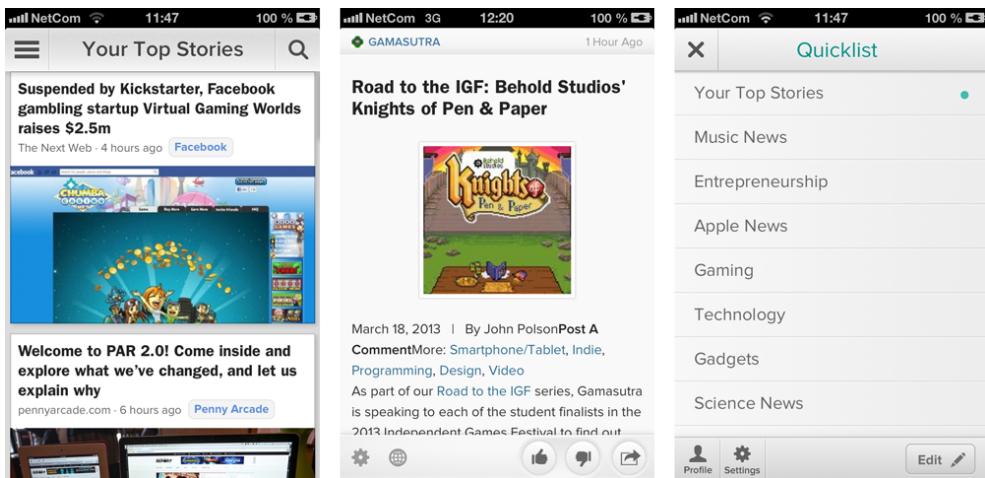


Figure 3.1: Screenshots from Zite showing the Top Stories feed, a single news article, and categories list.

Technology

Zite uses different approaches to personalize the news magazine for the user[9]. It uses automated algorithms to retrieve articles that are trending now by looking at how the different articles are discussed and shared on different websites, blogs, popular social network services, like Twitter and Facebook, and other news applications like Pocket and Google Reader. If an

article is considered less trending by the algorithm, it is less likely to appear in the news stream, although the user might consider this article interesting.

The user can also choose to login with one or more of the aforementioned social network services and news applications, and get news recommendations based on what is shared by the user itself and friends of the user, or based on what is stored by the user in the news applications.

Zite offers to save the user profile so the user can access its personalized news feed on different devices, but it does not limit the use of the application if a user chooses not to sign in.

The user can heavily influence what kind of news that are retrieved by rating different articles with the "thumbs up" or "thumbs down" buttons. The more rating the user gives, the better the personalization gets. Zite also keeps track of which articles the user is reading and which articles that are shared by the user and the user's connections on the social networks. This tracking influences the content delivered to the user.

In addition the user can search for different entities of interests, and further choose to like this type of entity by clicking a heart shaped button. If it is liked, this type of news will start to show in the main news stream. The user can also choose to add this entity to the "quicklist" to be able to quickly access only this type of news in the news stream.

A single source can also be blocked completely, as explained in the previous section.

3.5.2 Flipboard

Flipboard is a digital news magazine combining news of all sorts and events and feeds from social networks. Flipboard has gained much attention because of their joyful and easy-to-use flip-design.

User Interface Design

When launched, Flipboard greets the user with a front page consisting of different categories (see left image in figure 3.2). These categories are set by the user by clicking the "Your Flipboard" button shown in the right picture in figure 3.2. This settings screen is triggered by clicking the red ribbon in the top right corner of the start screen. While in the start screen the user can navigate further down by swiping or clicking one of the categories.

When a category is tapped, news articles from this category can be browsed by swiping up or down. Each category stream uses a full size view for each article, meaning that one article's preview uses the whole mobile screen. Each article's preview shows at least the title of the article, publisher

and/or author, and the time since it was published. The preview can also include an image, lead text, and how many retweets¹ this article has. The user can also bring up the settings screen from this screen by tapping the magnifying glass in the top right corner.

When the article's preview is tapped, the user is presented with the article screen (see the middle picture in figure 3.2). Here the user can swipe up and down to read the whole story. If the article is retrieved from a social network, the user has the opportunity to interact with the social network the article is gathered from, like retweet and favorite for Twitter or "like" for Facebook. The user also has the ability to share the article via other services or choose to read it later by clicking the "out of the box" arrow on the top.

Flipboard has a joyous, pretty and easy to use interface design, and has gotten a lot of attention because the app is considered to have a beautiful design[10] and a special flip-like animation that is used when scrolling the pages.[6][11]. Flipboard was also picked as "App of the Year" by Apple in 2010[5].

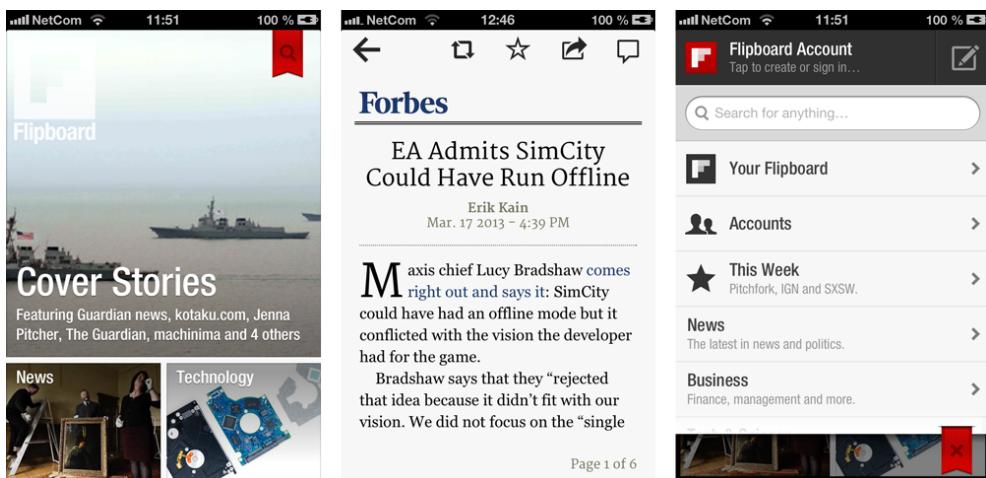


Figure 3.2: Screenshots from Flipboard showing the top categories, a single news article, and the settings view.

Technology

Flipboard allows users to include their own social feeds from Twitter, Facebook, Google+, along with RSS feeds. Flipboard also crawls the Internet for trending news articles and categorizes them accordingly.

¹A retweet is if someone on Twitter shares a Twitter message created by someone else.

Flipboard acquired the Ellerdale startup early on[2]. The Ellerdale project included a semantic data-analysis technology which started as a Twitter trend analysis before it was acquired by Flipboard. Using Twitter's firehose API² the Ellerdale Project was able to process all tweets, thousands per second, and categorize them by topic, rather than keywords[3] being able, in theory, to differentiate between Internet Explorer, Ford Explorer and Dora the Explorer. Further on Flipboard uses this technology to crawl social networks for trending topics and news, and being able to categorize them by topics to present useful and interesting news to the user.

The application offers the user the ability to create a Flipboard account to be able to access the personal feed on several devices. The application is still highly usable without creating an account, but some of the functionality is limited when not logged in. For instance, the user cannot save articles for later reading, like or comment articles without signing in.

3.5.3 Pulse

Pulse is a news reading application for iOS, Android and web browsers that supports HTML 5. It was released for the first time in 2010 and was awarded with the Apple Design Award of 2011[14].

User Interface Design

When first booted, a login is required, either by a Pulse account or via Facebook. When logged in the first time, the user is presented with a limited set of news categories which the user can choose from to add to its interests.

When done selecting category interests, the user is met with the main view, which is shown as the start up screen from now on, as shown in the first image in figure 3.3. This screen shows one category with several publishers sorted in rows. By swiping horizontally in a publishers row, the user can browse the different articles from this publisher. By swiping vertically the user can browse the different publishers in this category. If the user swipes to the bottom of the screen, it can click the "Add Content" button, and add more sources of liking.

The sources can be removed by tapping the "Edit" button in the top right corner, and to change the displaying category, the user can hit the menu button in the top left corner. The user then has the ability to select another category (see the last image in figure 3.3), or add more content to the news feeds.

²The Twitter Firehose API allows third party developers to get access to all tweets that are composed in real-time.

The main screen has a lot of information showing at the same time and can feel somewhat cluttered and overloaded.

When an article is tapped, the single article screen is presented (see the middle image in figure 3.3) to the user. This screen shows whatever information available from the source feed, like title, author, when the article was published, image and a lead text or article text if available. By hitting the action button in the top right corner, the user has the ability to save the article for later reading or sharing via Facebook, Twitter or email.

By swiping horizontally the user can switch between the different articles from the showing publisher, similarly to the main screen. The user also has the ability to show the whole article by either tapping the title or pressing the "Read on Web" button at the bottom of the article. By doing so, the full article is presented in a web view, showing the publishers own website with the given article.

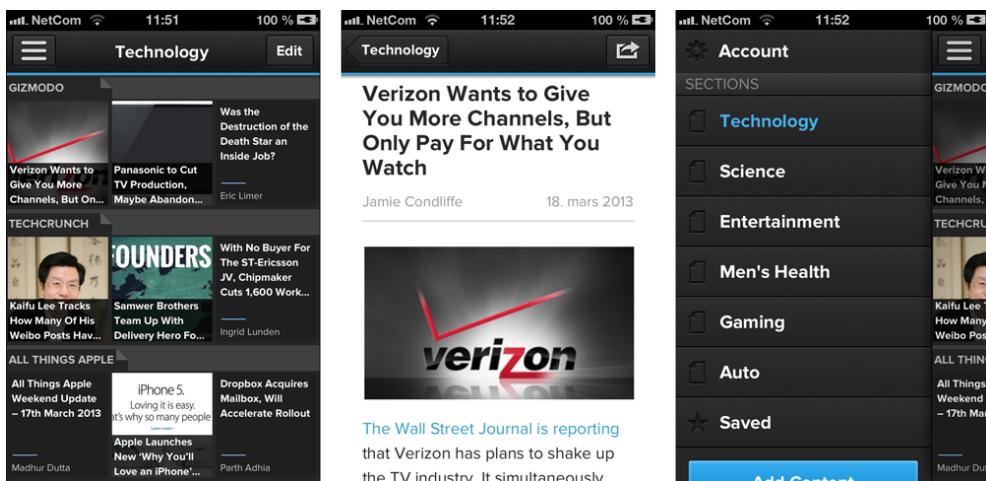


Figure 3.3: Screenshots from Pulse showing the start page, a single news article, and the categories/settings view.

Technology

On first startup, after login, Pulse lets the user choose from a dozen or so different categories to start off the news reading experience. These different categories gets news from different predefined sources added by the developers.

Pulse is mainly based on news publisher's RSS feeds, but allows the user to add their own social feeds from several social networking sites, e.g. Instagram, Facebook and YouTube.

The application also has the ability to search for feeds and add personal RSS feeds to a predefined category or a custom category. This way a user can add the newspaper feeds of their interests. Pulse can also check for the devices location and search for feeds that are nearby by using the GPS coordinates.

If logged in with Facebook, Pulse crawls the users news feed and finds articles previously shared or otherwise interacted with, and shows these article's sources in the recommended section.

3.5.4 Summly

Summly is a gesture oriented news aggregating application which was developed by Nick D'Aloisio in 2011. The main idea was not to personalize the news reading experience, but rather create intelligent summaries of the most trending news, by using advanced text analysis and natural language processing methods[20]. Summly was sold to Yahoo for reported 18 million GBP in March 2013[1], and was shortly after removed from the App Store, for Yahoo to use the summary technology elsewhere[19].

User Interface Design

The front page in the Summly application shows the user how many unread Summlys³ (s)he has. It also shows the title, publisher and category of a trending article as of now. The title of the trending article is also a button, and when clicked, the application opens the single article view showing the clicked article.

The single article view (see the second image in figure 3.4) shows the article's image, title, publisher, time since it was published, number of words in the full Summly and the short Summly. With horizontal swipes the user can navigate between different articles in the current showing category. To read the full Summly the user can double tap the anywhere on the screen. In the full summary the user can choose to close the full Summly by double tapping the screen again or open the article at the publisher's website in a web view by tapping a blue right arrow button.

In the single article view the user can also access the full article at the publisher's site by swiping down. To share or save this article, the user simply holds down one finger and a share view is presented where the user can save the article, or share it on Twitter, Facebook or mail.

By swiping up in the single article view the category view (first image in figure 3.4) is shown. Here the user can choose to read from another category

³A Summly is a summarized version of a website or article.

or add new categories, entities or topics by clicking the plus button at the bottom of the category screen. The screen where categories are managed are shown in the last image in figure 3.4.

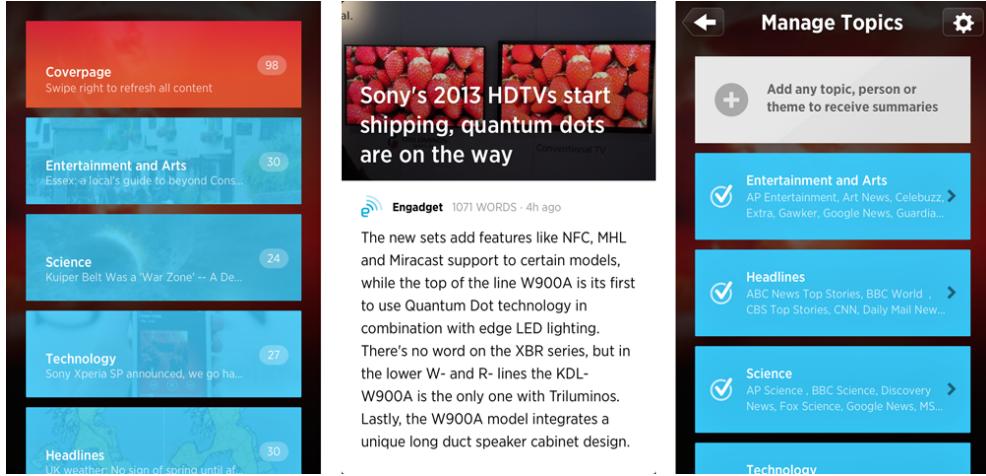


Figure 3.4: Screenshots from Summly showing the category selection page, a single news article, and the category settings view.

Technology

Summly has the ability to add custom categories, topics and entities as well as giving the user the latest and most trending news within these categories, topics and entities. Summly does not focus on personalization or recommendation, but rather on creating intelligent summaries of news articles, as earlier mentioned.

Summly states when talking about how the text summarization is done: "instead of a robotic, linear algorithm, Summly uses a genetic algorithm to mimic how a human actually thinks, using organic metrics to extract the most critical components" [16]. Summly uses an advanced algorithm based on machine learning and NLP to create their 400 character long summaries of the news articles. At first the summarization technique was rather basic, but it got more complex when Summly teamed up with SRI International[17].

As a result to not focusing on personalization and news recommendation, Summly does not have any form for log in other than using the built in sharing capabilities for Twitter and Facebook that already is present in iOS.

3.5.5 News360

News360 is a news recommendation application and according to themselves a "smart and elegant app that learns what you like and brings you stories from across the web"[12], available for iOS, Android and the Windows 8 series.

User Interface Design

On the first load, the user can choose to log in or continue without an account. Next, the user is prompted with a set of categories to select as interesting, a possibility to search for other entities to add to the feed, and an option to crawl the user's social news feeds for articles interacted with to add these topics to the personalization feed.

When the personal news feed is finished building, the home screen is presented to the user (see the first image in figure 3.5). This is also the first screen that meets the user when the application is launched after the initial setup is done the first time. News360 shows one news article per screen, and horizontal swiping is used to navigate to other stories. This screen shows the article image, if any, which category the story resides to, the title, publisher, how long ago since it was published and how many similar or related stories News360 has indexed.

By swiping down on this screen, the user can access the share screen, the "thumbs up" and "thumbs down" buttons to rate the article, and a save button, if the user wants to read the article later. By swiping up the user is presented with the lead text of the article and from here can choose to read the whole article by tapping the article or by hitting the "Continue" button.

When the single news article view is presented, the user has the same action buttons as by swiping down on the previous view, share, rate and save (see the second image in figure 3.5 in the top right section.). In this view the user can choose to read more of the story, view the story from the publishers website, or choose a similar story by another publisher, to get the story from another angle or view. The user can also get more stories from this publisher by clicking the publisher's name. If the publishers name is tapped, the user can navigate to other stories by this publisher, see the publishers profile and choose to subscribe to this publisher.

By tapping the button in the top left corner in the main view (see first image in figure 3.5), the menu view is shown (see the last picture in figure 3.5). From here the user can navigate to the other categories or entities that it has added. The user can also get news by location, edit existing topics, add new topics, search for news, read saved stories, log in or out, and navigate

to the settings section.

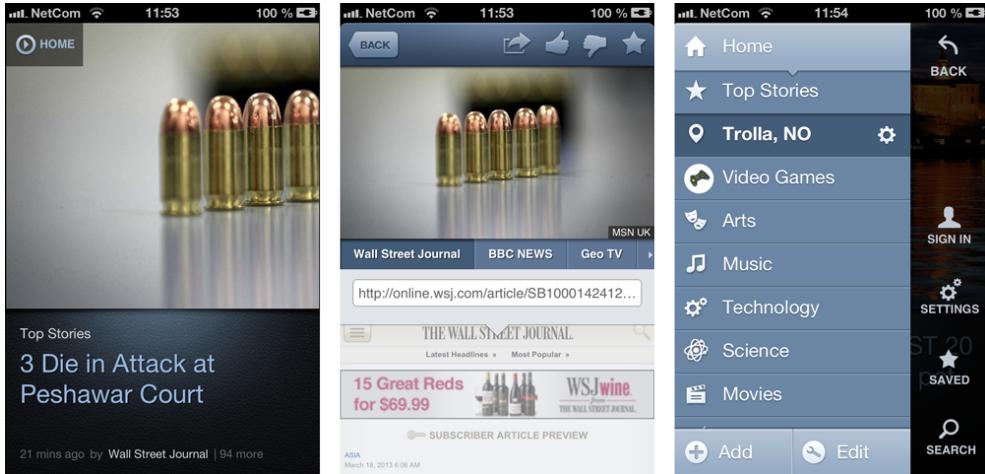


Figure 3.5: Screenshots from News360 showing the top stories feed, a single news article, and the category settings/selection view.

Technology

News360 uses a lot of advanced technology to be able to recommend news to the reader[13]. The semantic analysis platform is created from seven years of natural language analysis and development experience. News360 uses a self made sophisticated linguistic analysis engine to perform tasks like entity extraction, fact extraction, text classification, dossier generation and clusterization.

Further this engine is used in combination with a complex news-gathering system to analyze more than 100 000 articles a day in real time. From this analysis approximately 700 000 different people, locations, brands and companies are identified. Then the articles are tagged with locality and topics, and stored in clusters.

To understand which stories that are important, News360 uses a ranking algorithm which checks the impact of the sources that are aggregated, and all the articles that are published in that source. The system also checks the audience and credibility of the source and author, text characteristics and the velocity of the news event as it is happening.

News360 also gives the user the ability to tailor these recommended news by letting the application check the user's social feeds to find articles and sources interacted with. The user can rate each article with "thumbs up" or "thumbs down" buttons to have an impact on which news are shown.

With their semantic analysis, News360 also offers the user the ability to read similar stories, but from different publishers, to have the ability to view the news event from several points of view and angles.

A summary of the work flow, gathered from [13], is shown in figure 3.6.



Figure 3.6: The workflow of the News360 news system

3.5.6 Circa

Circa is a mobile news application for the iPhone that summarizes news for the user by using real editors on the most trending news and breaking these news stories down to short paragraphs and bullet points[4].

User Interface Design

When first loaded, the user can login, create an account, login with Facebook or choose not to log in at all.

Circa has three main views, the news feed, the single news view, and the category selection view, which is shown in the three images in figure 3.7 respectively.

The news feed is the start screen when the application is launched. The user is presented with images from the most recent and trending news at the top in a horizontal scrollable view, followed by an endless vertical scrollable view with news stories from the category chosen. From here the user can

browse through more news stories by swiping up in the vertical scrollable view.

To enter the whole story (second picture in figure 3.7) the news story has to be tapped. The single news view has three buttons in the top right corner. The first, an "i" button, shows which sources Circa's editors has used to create the summaries that are presented to the user. These sources are also clickable, if the user wants to open the whole article in a web view. The second, a share button, lets the user share the whole article or some part of the summary via Facebook, Twitter, mail or SMS. The last, a plus button, lets a user subscribe to the news story, meaning that the user will be notified if there is new information added to the news story, which happens when an editor changes a news article in some way.

To head back to the news feed the user can either tap the back arrow in the top left corner, or swipe right. To bring up the category view (last image in figure 3.7, a user simply taps the button in the top left corner in the news feed view or swipes to the right. Here the user can choose another category by tapping the wanted one and the chosen category will be loaded and shown in the news feed.

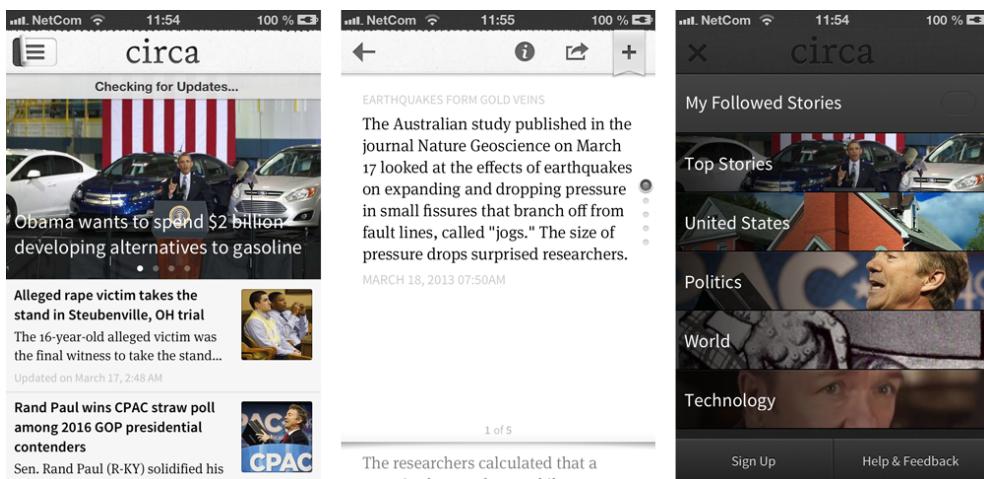


Figure 3.7: Screenshots from Circa showing the top stories feed, a single news article, and the category selection view.

Technology

Similar to Summly, Circa does not focus on the personalization and recommendation part of the news reading experience, but more on the part of

bringing the most essential parts of a news article to the user by creating summaries.

While Summly uses NLP and machine learning to do so, Circa has an own editorial staff, working solely with creating summaries for the news reader, in terms of bullet points, facts, quotes, photos, maps and related stories[4].

3.5.7 Wavii

Wavii is something in between a news application and a social network application, and has been called "A Facebook for Topics"[18]. The main idea is that a user can follow topics and interact with these topics, rather than friends on Facebook, for instance. The user gets a news feed of interesting topics, where the sources of these news feed instances can be news sites, Twitter, blogs, etc., and the user can share his/hers reaction to the story, comment and share with friends.

User Interface Design

To be able to start using Wavii, the user has to login, either using Twitter, Facebook or by creating a Wavii account with an email address. After login the user is prompted with a screen to start following topics.

The start screen is a news feed showing followed topics and is an aggregated endless feed of all topics that is followed (see first image in figure 3.8). Each story in the feed is an event and includes one or more topics that is followed. The story can be interacted with in several different ways, like share reaction in terms of different predefined facial expressions shown as simple drawings, commenting, sharing on social networks and poll questions.

The top bar is scrollable in a horizontal direction, and here the user can change the main category of the news feed, in terms of categories extracted from the different topics followed. By hitting the menu button in the top left corner, the navigation view, shown in last image in figure 3.8, is revealed. Here the user can navigate to the different main views of the application, like the main feed, user profile, discover new topics, search for friends and settings.

When a story in the main feed is tapped, the single story view, shown in the second image in figure 3.8, is shown. In the single story view the news story, twitter feed, or whatever the source of this event is, is shown. The user also has the ability to read a part of the source that caused the event, or open the whole source in a web view. The single story view also shows which stories or events that are concerning the showing event, in terms of clickable boxes, and lets the user follow that story or event by simply clicking it. At

the bottom of the single story view, a dozen of related topics and events are shown, these also as boxes, and by clicking these the user can easily start following it.

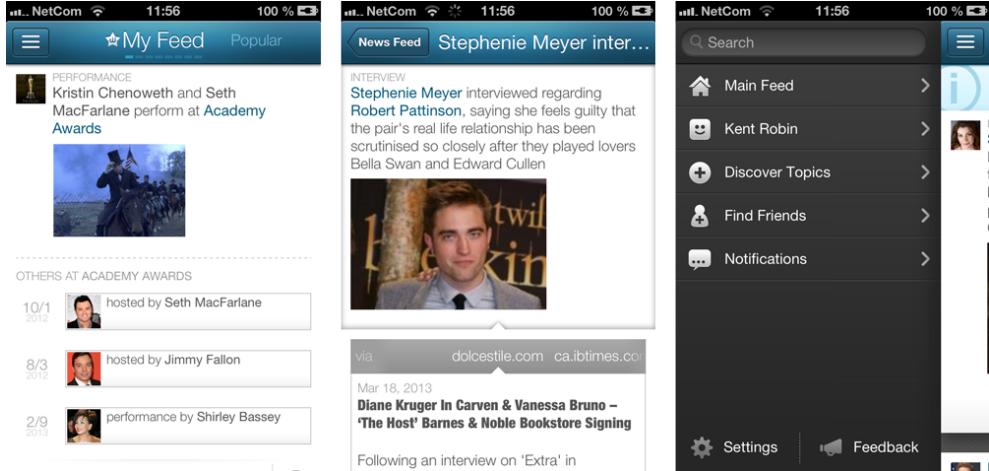


Figure 3.8: Screenshots from Wavii showing the top stories feed, a single news article, and the category selection/settings view.

Technology

To help you find interesting topics, Wavii can crawl the user's social feeds, and propose a set of topics to follow, based on what the user and the friends of the user has interacted with. The user can also search for topics to follow.

To extract topics and events, Wavii uses a proprietary algorithm for NLP[15]. Oren Etzioni, a professor of computer science and a specialist in the field of AI, at the University of Washington, who also is an advisor to Wavii, says that Wavii uses a state-of-the-art extraction algorithm to gather topics and events[18].

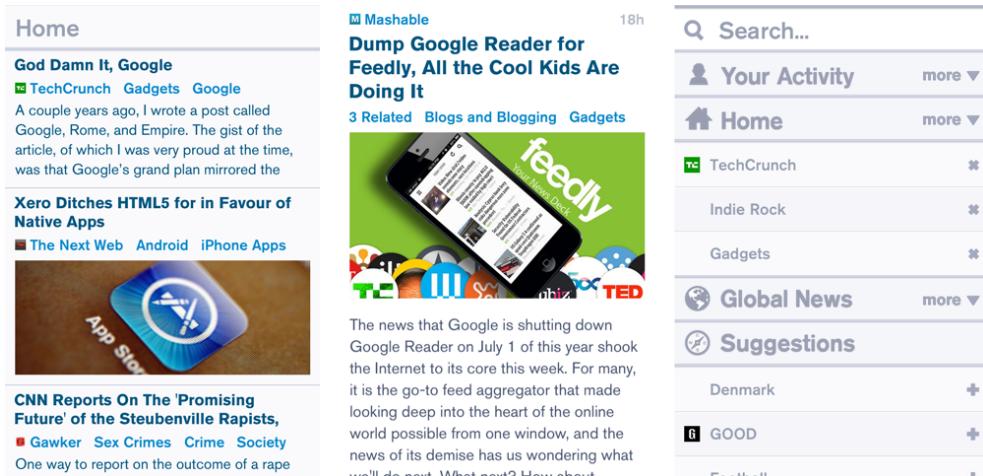


Figure 3.9: Screenshots from Prismatic showing the top stories feed, a single news article, and the category selection/settings view.

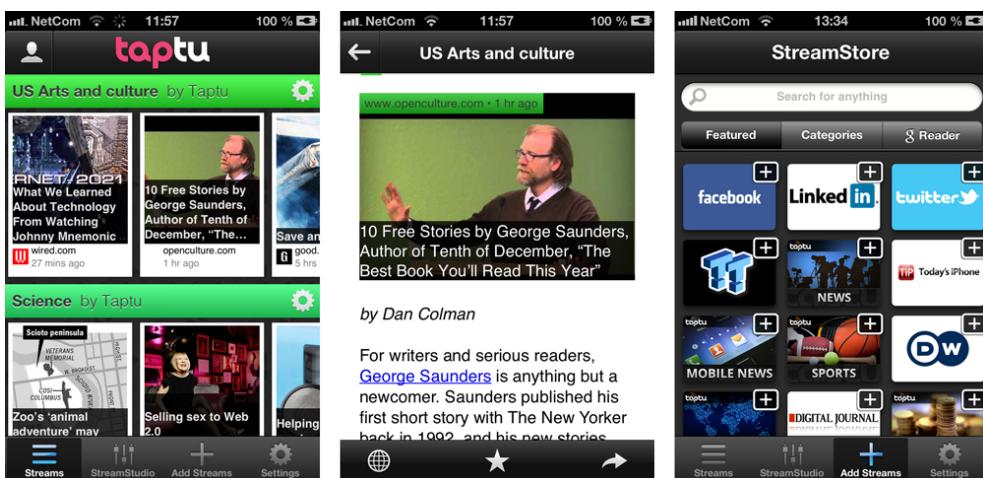


Figure 3.10: Screenshots from Taptu showing the top stories feed, a single news article, and the category settings view.

3.5.8 Prismatic

User Interface Design
Technology

3.5.9 Taptu

User Interface Design
Technology

3.5.10 Feedly

User Interface Design

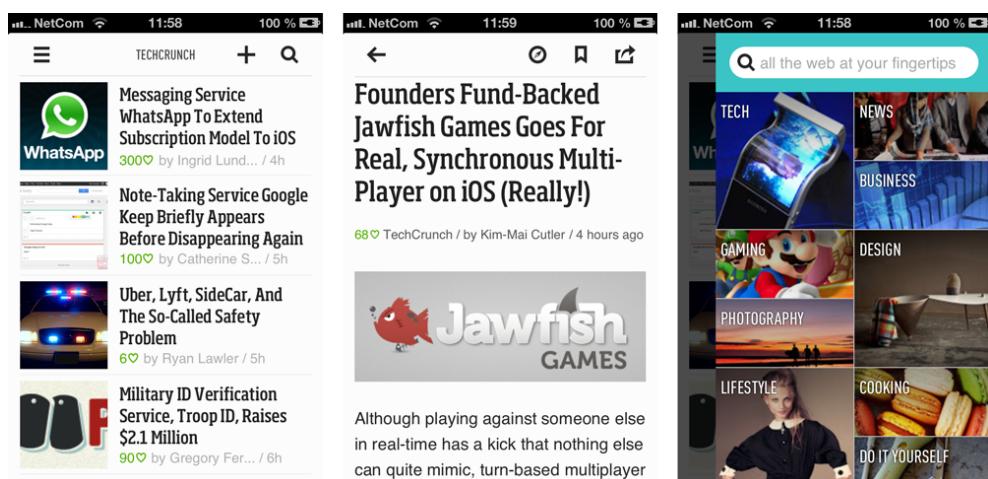


Figure 3.11: Screenshots from Feedly showing the top stories feed, a single news article, and the category settings view.

Technology

3.5.11 Comparing the Commercial Applications

Feature/Apps	Zite	Flipboard	Pulse	Summly	News360	Circa	Wavii	Prismatic
News Sources	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Clear/Cluttered UI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Filtering	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sharing	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Login	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Chapter 4

Mobile information delivery application use case

Part III

**Det jeg skal gjre kommer vel
her?**

Chapter 5

Perspectives

Talk some about the different perspectives there is considering news recommendation applications. Create a framework for comparing them..

Chapter 6

Mobile features

Which particular mobile features that support mobile news UX
swiping vs. clicks

Part IV

Evaluation and Conclusion

Chapter 7

Evaluation

Chapter 8

Conclusion

Chapter 9

Further Work

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Appendices

Appendix A

Code Samples