

Vestlandsforskning report no. 4/2013

Travel Notebook

A digital planning service for travelers and the tourism industry

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Vestlandsforskning report

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Foreword

The Travel Notebook pre project was financed by the regional research fund in addition to fundings from Fjord Norway/NCE Tourism. The project is based on an idea of a travel notebook application developed by NCE Tourism.

Researcher dr. ès sc. Terje Aaberge has been the project manager and has written chapters 1, 3, 4 and appendix 3. Researcher Svein Ølnes has written the rest of the report. Together with research manager Ivar Petter Grøtte and research assistant Guttorm Flatabø they have constituted the project group.

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0. Summary

Our user survey shows that travellers want the functionality described by a Travel Notebook (TN). Our survey of existing tools also shows that despite the amount of travel related services and apps, no single tool on the market covers the planned functionality of the Travel Notebook. **Our conclusion is therefore that the Travel Notebook should be developed.** It has the potential to both benefit the travellers and give the destination marketing organizations (DMOs) a unique possibility to get in contact with the travellers at an early stage. We also believe the **virtual concierge** can be a very valuable service in that respect. The service could be a real game changer for the local and regional tourism industry, and important even on a national level.

After analysing the user needs and the available services on the market we end up with two alternatives for realizing the Travel Notebook:

1. To collaborate with the makers of one of the tools in order to reduce risks, reduce resource needs, and to get a more market oriented product. From a technical and organisational point of view, the Norwegian web based travel planner and app *Stay.com* seems to be the best candidate
2. To develop the Travel Notebook from ground up but with as much reuse of components and information as possible. We suggest **a stage based approach** realizing the easiest parts first and with the possibility to change the development plans underway

In this report we have concentrated on describing alternative 2. The project owner must consider if an alternative based on an existing service is worth pursuing.

We advise the development of a Travel Notebook to follow these guidelines in order to **reduce the risks** as much as possible:

- The Travel Notebook must be built on a robust and open service-oriented framework
- Choose a stage based development and carefully consider alternatives at each crossroad
- The development should at first concentrate on the planner part of the service
- User feedback suggest that the guidebook and especially the diary part are of less importance and should hence be delayed
- Reuse of information is the key to lower the risk – one should always look for services that already have a solution to the problem and try to reuse these by integration

From a **technological point** we advise the Travel Notebook be built using the following principles:

- The Travel Notebook must be based on a service-oriented architecture (SOA)
- The dialogue with the TN should be REST based web services
- There are multiple interfaces to the TN (traveller, DMO, CRM, CMS, external services)
- There must be different levels of integration to the TN (from deep to shallow)
- The TN must meet all the needs of the traveller and cannot be restricted to (Fjord)Norway

We further suggest a development with two parallel tracks; one for developing the Travel Notebook based on today's prevailing technology, and one research project further enhance the Travel Notebook using the Internet of Things and Linked Open Data principles. Our estimate for realizing the Travel Notebook is in the range of **3,0 – 3,9 mill. NOK**, not including the research part (Internet of Things/Linked Data). Also yearly costs running the service must be taken into consideration. These are not estimated in this project.

0. Samandrag

Analysen av brukarundersøkinga viser at turistane ønskjer den funksjonaliteten ein reiseplanleggjar representerer og at dei i dag ikkje har gode verktøy til dette. Evalueringa av aktuelle løysingar på marknaden viser at trass i ei stor mengd tenester og app-ar, er det ikkje eitt enkelt verktøy som løysar alle behova. Det er generelt sett også stor mangel på utvekslingsgrensesnitt (API) noko som reduserer mulegheitene for gjenbruk. **Konklusjonen i denne rapporten er difor at ein reiseplanleggjar (Travel Notebook) bør utviklast.** Ei slik teneste har eit stort potensial både for dei reisande og reiselivstilbydarane, og det kan gi destinasjonane ein unik mulegheit til å komma i kontakt med dei reisande på eit tidleg tidspunkt og betre analysere trendar og planleggja sesongen. Tenesta har potensial til å bli eit kjerneprodukt i arbeidet med digital marknadsføring og tilrettelegging for turistane, særleg den funksjonen vi har kalla **den virtuelle concierge**.

På bakgrunn av analysane og undersøkingane har vi enda med to alternative strategiar for realisering av ein reiseplanleggjar:

1. Gjennom samarbeid med ein eksisterande kommersiell aktør ved å byggja vidare på denne si teneste. Det vil redusere risiko og kostnader, men også gi noko mindre fridom. Ut frå undersøkingane våre ser vi den norske tenesta *Stay.com* som den mest aktuelle ut frå teknologiske og organisatoriske tilhøve.
2. Utvikla reiseplanleggjaren frå grunnen av, men med så stor grad av gjenbruk og integrasjon mot andre tenester som muleg.

I denne rapporten blir berre alternativ 2 drøfta. Prosjekteigar må vurdere om alternativ 1 er aktuelt. Vi tilrår ei utvikling basert på desse overordna retningslinjene for å redusere risiko mest muleg:

- reiseplanleggjaren bør baserast på eit robust, ope og **teneste-orientert rammeverk** (SOA)
- ei **stegvis utvikling** der dei enklaste funksjonane blir realisert først og der prosjektet kan endrast undervegs med ny informasjon tilgjengeleg
- **gjenbruk av informasjon** er nøkkelen til redusert risiko – ein bør alltid vurdere om andre tenester har den aktuelle funksjonaliteten og informasjonen i staden for å utvikla sjølv

Frå eit teknologisk synspunkt tilrår vi at reiseplanleggjaren blir basert på desse retningslinjene:

- teneste-orientert arkitektur (SOA)
- dialogar mest muleg basert på web services etter REST-prinsippet
- ulike integrasjonsnivå, frå djup integrasjon til overflatisk
- reiseplanleggjaren må tilfredsstilla alle behova til dei reisande og kan ikkje isolerast til å fungera berre på Vestlandet eller i Norge.

Vi føreslår vidare ei todelt utvikling der første delen går ut på utvikling av ein reiseplanleggjar med dagens teknologi, og med eit forskingsbasert tilleggsprosjekt som klargjer for bruk av Internet of Things/lenka data-prinsippa. Estimata våre for etablering av ein reiseplanleggjar basert på dagens teknologi, er i området **3,0 – 3,9 mill. NOK**. Drifta av ein reiseplanleggjar som skissert i denne rapporten vil også medføre årlege kostnader som vi ikkje har estimert her.

1. Introduction

1.1 A Travel Notebook

The Web is at present undoubtedly the most important marketing channel for the highly marketing intensive tourism industry. In order to attract visitors, destination management organisations (DMO) present the destinations they are responsible for, whether it is a town, region or country, on web sites in terms of descriptions of attractions to visit and activities offered, as well as necessary services like transport, accommodations and restaurants. For the prospective visitors the tourism web sites thus become tools for planning visits. Travel Notebook is intended to enhance the planning aspect of tourism web sites by adding functionality that makes it possible to record a plan, extract the plan as an off-line guidebook and edit a travel diary complementing information from the plan by including personal comments, ratings, reviews, photos and videos.

The Travel Notebook will consist of an integrated set of digital tools, a Travel Planner, a Travel Guidebook and a Travel Diary supporting travellers during the phases of the Journey lifecycle¹ and supplemented by tools that extract information about user behaviour from the Planner and Diary:

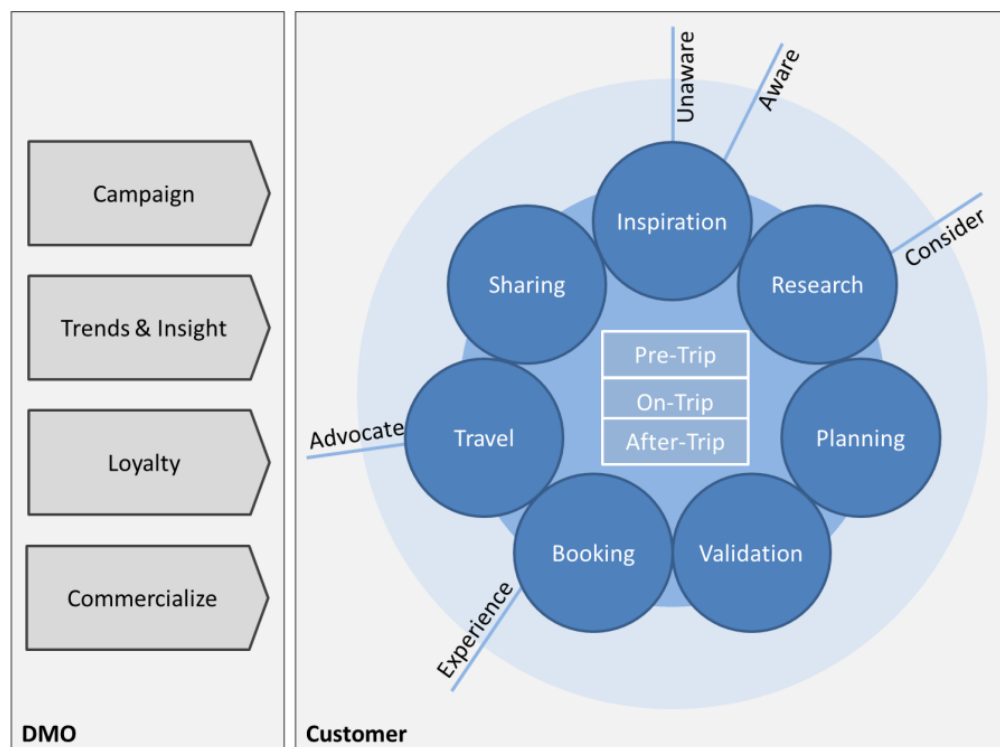


Figure 1: Journey lifecycle (Cole et al., 2011)

¹ Partly based on the work of Henry H. Harteveldt, Forrester Research [1] and [2].

Pre-Trip: Trip planner	<p>Inspiration: support campaigns or provide a tool for personal recommendations</p> <p>Research: give access to web sites and digital services for tourism information, transport, accommodation etc.</p> <p>Planning: provide means to store information about the selected items</p> <p>Validation: sharing gathered information with friends/relatives through a presentation of the selected objects and make an assessment based on their reaction and on existing evaluations on the social web and Travel Notebook in order to finalise choices</p> <p>Booking: booking of travel services/products and automatic storage of booking information</p>
On-Trip: Travel Guidebook	<p>Travel: extract a personalised Travel Guide from final plan; Possibility to adapt the guidebook during the trip (e.g. due to bad weather forecast)</p>
Post-Trip: Travel Diary	<p>Sharing: report experiences (impressions and evaluations) during the journey through the Travel Guidebook thereby creating a Travel Diary</p>

The objective of this project has been *to establish the prerequisites for the development of Travel Notebook* as an integrated suite of online travel services that will

- support the travellers during their planning of a journey, the journey and finally the sharing of experiences with others
- make it possible for the destination management organisations (DMO) to obtain information about the travellers' interests and experiences

These prerequisites include requirement analysis and specification, architecture and research/development plan for Travel Notebook of which this report gives the outline.

The specification is based on surveys of user behaviour and of the functionality of existing planning tools and services, the results of which are summarised in two scenarios, exhibiting respectively, the traveller and the DMO marketing person. The proposed development plan takes into account the existing infrastructure used in the Fjord Norway region, the main part of which is provided by tellUs. This project and the description of a Travel Notebook is based upon a vision document and video produced by NCE Tourism (NCE Tourism, 2011).

1.2 User scenarios

Travel Notebook has two distinct user groups, the travellers and the destination management organisations/product owners. The following traveller scenario is divided into the series of actions listed in Figure 1.

Traveler scenario

Eve and John and their two children Jennifer and Mark aged 12 and 14 years are discussing where to go on their next holiday trip. They have for several years gone to the Mediterranean attracted by the Sun and possibilities of bathing. This year however they would like to do something new and more demanding. They have friends that have gone to France to visit Disneyland in Paris and this seems very exciting for the children but the parents would rather go to the north to Norway because Eve's parents went there last year and they strongly recommended a visit to the fjords. They had gone to Bergen and from there visited the fjords of Western Norway and were very enthusiastic about their experience. Both their account of the visit and the photos and videos they could show supported the enthusiasm.

To convince the children that this could be as exciting as a visit to Paris Disneyland John made an exploration of attractions and activities in Western Norway using web sites and consulting reviews made by tourists. He activated the planning function on the tourism web site of Western Norway, made a selection of attractions and activities, registered to open an account on the site and saved the selection on the account. The content was automatically organised as in the original web site. The task was simplified by the function that permitted search based on defined interests taking into account the need to convince Jennifer and Mark. He then gave a presentation for the family based on the selection and managed to gain support for the choice of Western Norway as the next holiday experience.

Once they had decided, John sat down to complete the planning. They did not want to bring the car but use public transport, take the plane to Bergen and then use boat and bus. He ordered the places to stay on the round trip chronologically by establishing a time table. The itinerary was then traced on a map in his Travel Planner. By making a search he then automatically got a list of available transport possibilities between the places on the itinerary chosen with schedules and prices that was saved.

He then made a day to day plan for the stays, including an automatically generated itinerary connecting the attractions to visit in Bergen, the point of entrance for the trip. The travel plan was presented both as a map with the itinerary and as a timetable. To validate his choices John gave the family an overview through a presentation on the TV screen which was used to make the final selection of accommodations, attractions and activities.

A booking service for accommodation and activities is available through the tourism web site. John therefore books both of accommodations and some activities. Booking information and

confirmation is automatically stored in the travel plan. He then extracted the travel plan as an offline app that he downloaded to both his tablet and smart phone to serve as a travel guidebook. Having arrived in Bergen they made a stop at the local tourism information office to see if there were anything they had missed. This resulted in a visit to the VillVite - Bergen Vitensenter which had escaped their attention during the planning phase. This change was recorded in the plan. To document the trip they made photos and video clips during the day, while in the evening John graded and reviewed the accommodations, attractions and activities as well as their descriptions using the forms available in the guidebook. The result was automatically added to the travel plan that now started to take the form of a travel diary.

During the trip they used vouchers being part of the booking confirmations kept in the Travel Guidebook to “pay” accommodations. The weather was not perfect but the scenery largely compensated for that inconvenience, though on a couple of occasions they had to drop the planned activity and make a replacement after having consulted the Google Travel Forecast automatic update of the local weather. During the trip they were also alerted by e-mail about events that took place in the neighbourhood.

Throughout the trip Eve and John both contributed to the diary. Back home they reedited the travel diary and added photos and video clips. The result constituted the content of a well organised web site that gave the full account of the trip by complementing the information from the travel plan with own additions. Before transmitting the URL and access rights to friends and family however, they invited Eve’s parents for a presentation. The presentation, given in the slight show version, retraced their steps by following the time table. They also ordered glossy albums from a Norwegian supplier based on a PDF-extraction.

Destination management organisation (DMO)/ product owner scenario

As the editor of the DMO web site one of Nils’s tasks is to develop and effectuate efficient marketing plans. Important background information for the corresponding decisions is how the web site, which is their most important marketing channel, is used. For this he possesses analytic tools that provide the user statistics of the web site. Moreover, the actual use of the Travel Notebook put at the travellers’ disposal contains valuable information about user behaviour. The marketing strategy therefore includes continual amendments of these tools and adjustments to observed changes in trends, but it also involves actions to improve the tourism products.

During the months from February to April when the travellers do the main planning for the summer holiday, Nils is reading and interpreting the statistics reports generated by the Travel Notebook every week. The reports give information on the daily, weekly and monthly occurrences of individual events as well as on aggregates of similar events gathered over several seasons. The statistics pulled from the Travel Notebook consist of pages that have been selected for the plans during the planning phase, the pages that has been downloaded to the travel guidebooks, and during the holiday season, the ratings and reviews in the travel diaries from which he can judge the correspondence between expectations and on site experience. The information is given in tables and by curves tracing the

evolution. The comparisons of statistics over several years make it possible to determine trends in interests which according to experience tends to result in change in user behaviour.

Nils also uses quite much time answering tourists and helping them preparing their plans. In all direct support the users have given their consent to letting the DMO access their plans.

After the holiday season is over he makes a more profound analysis by comparing the choices in Travel Planner/Guidebook with the contents of the Travel Diary. The result gives among other things the fractions of actual travellers in relation to those opening an account on the Travel Notebook, finalising a guidebook or establishing a travel diary. Moreover, the evaluations give important information about user satisfaction with respect to individual attractions, activities and accommodations. Nils uses the result of his analysis as input to the development of a marketing plan for the next season. Moreover, he communicates his findings to the relevant organisations with the hope that bad evaluation may trigger some action on their part that results in improved products. After all, in the long run a good reputation is the best marketing but this presupposes an attractive product.

He also conducts a short survey among the users that have given their consent to be contacted after the journey. Through a few questions he is able to draw a better picture of the overall satisfaction and also list the things that can be improved. Nils prepares a short report of the survey adding some facts and Figures from the Travel Notebook statistics and sends it to the members of the DMO asking them to read carefully the things that need to be improved till next season.

Summary of the introduction

- A Travel Notebook is proposed based on the initial report and video from NCE Tourism (NCET) and with the Seven Travel Planning Steps as a structural guide
- The user scenario calls for
 - a flexible planning system
 - a system that enables the DMOs to get in touch with the travellers at the planning stage in order to help them
 - a simple recommendation engine that can be developed further at a later stage functioning as a *virtual concierge*
- The DMO scenario calls for
 - a system that gives a good statistical overview of the aggregated plans
 - where the traveller has given her consent: a possibility to get the details of the individual plans and possibility to give advice and recommendations
 - where the traveller has given her consent: possibility to run surveys after the end of the journey in order to capture user satisfaction and tips on things to improve
 - The Travel Notebook as a base for customer analysis and marketing planning

2. User survey

2.1 Method

A survey was conducted and online questionnaire sent to people in USA, UK, France, and Germany. In addition the English version of the questionnaire was put up on Fjord Norway's homepage (www.fjordnorway.com). The questionnaire is given in appendix 1.

The questionnaire was sent to audiences in US, UK, France, and Germany by the company *SurveyMonkey* who also operates the service used to conduct the survey, and in addition put up on FjordNorway's website. The audiences consist of randomly chosen people over 18 years, within a 90 % confidence interval². The survey was carried out in January 2013. Table 1 shows the distribution of responses by nationality.

We do not have the exact number of people receiving the invitation to participate in the survey but SurveyMonkey says that the typical response rate in similar surveys is 4 – 7 %. That is when response rate is calculated as (completes/invited *100). The questionnaire on FjordNorway's home page generated 46 responses but we do not know how many people were accessing the site in this period and can therefore not tell the response rate.

It is important to point out that the respondents from US, UK, France, and Germany have no connection at all with Norway. These are people answering the questionnaire by referencing to their last holiday, wherever it was, and wherever they plan to go next.

Questions 9 – 13 dealing with booking was added due to another project. A separate report has been made for analyzing this part of the question (Ølnes and Simonsen, 2013).

2.2 Background information

Table 1: Distribution of responses by nationality

Land	Tal svar
UK	126
USA	114
Germany	107
France	117
Netherlands	18
Norway	8
Other countries	8
Sum	498

² Om SurveyMonkeys utval og representativitet: http://help.surveymonkey.com/articles/en_US/kb/Who-is-the-SurveyMonkey-Audience#audience-demographics

The distribution by sex was **57 % men and 43 % women**. All together 550 respondents started to answer but only 498 of them completed the questionnaire. All results are from the 498 responses.

Table 2: Respondents by age in percentage of N (N = 498)

Age	Prosent
< 20 år	2,8
20 - 30 år	17,1
31 - 45 år	35,3
46 - 60 år	27,1
> 60 år	17,7

2.3 Results

The tourists (= the respondents) on average **start to plan a holiday about 4 months before travelling**. This is also confirmed by other surveys carried out by Visit Norway (BIT Reiseliv og NHO Reiseliv, 2011). In their surveys from 2009 and 2010 they found that the travellers on average start to plan their travel (to Norway) in the end of February – that is approximately 4 months before travelling. In the same surveys 70 % of the respondents said they booked the travel on the web.

Table 3: Resources used in planning, % of N (N = 1043)

Resources	Prosent
General tourism websites	20,2 %
Destination websites	13,3 %
Social media	6,9 %
Brochures	13,7 %
Guidebooks	10,5 %
Travel agency	11,3 %
Family and friends	16,9 %
Other sources	7,2 %

General tourism websites (Tudors, Michelin, Lonely Planet ++) are most used resources for planning, and substantially more used than for instance destination websites.

Table 4: What part of the vacation did you plan? (N = 667)

Part planned	Prosent
Route within the destination	47,8 %
Attractions and activities	39,4 %
Other	12,7 %

In addition to travel to the destination and accommodation, travel within the destination is what most plan before travelling.

Table 5: How do you keep your information? (N = 785)

Information keeping	Prosent
Bookmarks in the web browser	16,8 %
E-mail	38,0 %
Downloaded travel information	28,3 %
El. notebooks	5,5 %
Tailored applications	2,9 %
Other	8,5 %

Most travellers keep their travel information in emails. Also downloading it (and eventually print) is a fairly common way of keeping the information. Not many travellers keep their information in electronic notebooks or tailored applications, which is part of what the Travel Notebook will offer. The specification of the category 'Other' consists of Word, a separate folder, handwritten, agency to name a few.

Table 6: What did you book in advance? (N = 723)

Booked in advance	Prosent
A package tour	24,6 %
Accommodation	32,6 %
Travel within the destination	22,5 %
Attractions and activities	12,6 %
Anna	7,6 %

Package tour and accommodation must be seen together because also in a package tour accommodation will be booked in advance. Together the two alternatives count for 57,2 % of the responses. Attractions and activities are not booked in advance by many travellers, but this must be seen in light of the possibilities of booking these things, which is often difficult. The fact that 39,4 of the responses indicate that attractions and activities is part of the planning, the potential for increasing bookings in this area seems great.

Table 7: Did you follow your plan? (N = 480)

	Prosent
Yes	48,3 %
Yes, mostly	43,8 %
No, made a lot of changes	7,9 %

Most of the travellers kept to their initial plan without many changes underway.

Table 8: Did you use any electronic devices on the trip? (N = 480)

	Prosent
Yes	59,2 %
No	40,8 %

Almost 60 % of the respondents used an electronic device on their latest holiday trip.

Table 9: What type of electronic device(s) did you use? (N = 432)

Device	Prosent
Smartphone	46,1 %
Tablet (iPad ++)	20,6 %
PC	25,2 %
Other	8,1 %

Not surprising smartphone is the dominating electronic device brought on a holiday trip. But we also see that pc's and tablets are quite common.

Table 10: What did you use your el. device(s) for? (N = 708)

Device used for	Prosent
General information	28,1 %
Complementing travel information	16,7 %
Additional bookings	6,1 %
Find nearby attractions	19,1 %
Find out "what's on"	6,9 %
Share travel information	13,1 %
Work	4,8 %
Other	5,2 %

Most travellers use their electronic devices for general information, but also to find nearby attractions and for additional travel information. Attractions seem to be more interesting than activities and events ("what's on").

Table 11: Did you share your experiences from the trip with others? (N = 560)

Shared with	Prosent
Family and friends	75,2 %
Social media	24,8 %

85 % of the respondents (75 % of the responses) shared their information with family and friends. 28 % of them shared information through social media.

Table 12: Have family or friends travelled to places you have been because of your recommendation? (N = 370)

	Prosent
Yes	50,3 %
No (not yet)	49,7 %
I don't know	28,9 %

As we see from the table above happy visitors give the best marketing effect. The choice of holiday destination is heavily influenced by family members and friends.

Table 13: What features should a digital travel planner have? (N = 1283)

Wanted features	Prosent
Tickets, booking info (all in one place)	25,0 %
My personal list of attractions etc.	17,2 %
Route plan (car, public transport)	21,4 %
Show nearby attractions and activities	21,7 %
Diary	10,7 %
Other	4,0 %

This is the only question in the survey that is directly tied to the Travel Notebook. Of course it is difficult to answer questions about a tool that you do not know. That would be like Henry Ford when he was asked why he did not ask his customers when he built the car: "If I had asked the customers they would only have wanted a faster horse". It is difficult to imagine something you have not seen or do not know in other ways.

There is clearly a need for a tool that keeps all the travel information in one place. Also information about attractions and activities and a route plan is wanted. The diary feature is not as important.

Summary of the user survey

The survey conducted in this project has given valuable input to the process of planning a Travel Notebook. The main take-aways from the survey are:

- The planning of a holiday starts about 4 months before the travel
- There is a lack of suitable tools for keeping travel information. People keep the information mostly in emails and downloaded copies.
- In addition to accommodation, travel within the destination and attractions and activities are the most common parts of the holiday that are planned in advance
- Although an important part of the planning, attractions and activities are rarely booked in advance (probably because of missing booking opportunities)
- Smartphones and other electronic devices are very common. A Travel Notebook must be designed to fit a variety of devices
- Keeping all relevant travel information in one place is the most important part of a digital travel planner. Also list of attractions and activities and a route plan is needed.

3. Survey of existing services and tools

The definition of a trip planner used in this report is that of a service making it possible to select and store information about tourism products such as accommodations, attractions and activities at a given destination; it thus becomes a personalised on-line guidebook that might also be available as an off-line app on a mobile device or as a printout.

3.1 Relevant services and tools - overview

There exists a variety of web sites that help travellers to plan and carry through holiday trips, ranging from tourism web sites to booking services and among which are the trip planners, organisers and recommenders as well as all kinds of combinations (see list in Appendix 1). We have looked at a range of travel planners and picked the most interesting given the Travel Notebook requirements. Table 14 summarises the result of a survey of the functionality of our selection of trip planners³, organisers and recommenders of special relevance:

Table 14: Overview of features of relevant tools

Service	Itinerary generator	Reviews	Sharing	Day plans	App	PDF	API	Organiser
Stay.com ⁴		x	x		x			
City Trip Planner ⁵	x				x		x	
Go pro travelling ⁶	x			x				
Plnnr ⁷	x	x	x			x		
Traveezy ⁸	x							
Voyajo ⁹			x			x	(x)	
Triplt ¹⁰							x	x
Yahoo! Trip Planner ¹¹	x	(x) ¹²	x	x		x	x	x

The travel planners cover only the main cities of the world and their immediate surroundings. Their main assets are the information they provide about attractions, accommodations etc. Some of them propose an itinerary between the places in a city, but only Go Pro Travelling proposes itineraries

³ They are all restricted to town destinations with a few examples of outside attractions. We have found none that covers a wider area.

⁴ <http://www.stay.com>: <http://www.pcmag.com/article2/0,2817,2412950,00.asp>

⁵ <http://www.citytripplanner.com/en/home>

⁶ <http://www.goprotravelling.com/>

⁷ <http://plnnr.com/>

⁸ <http://www.traveezy.com/>

⁹ <http://www.voyajo.com/>

¹⁰ <https://www.tripit.com/>

¹¹ <http://travel.yahoo.com/trip>

¹² via TripAdvisor

between distant places, by plane for long distance and road for short distance. None offer any possibility for the planning of a trip with public transport. Additional travel planning sites and apps are listed in appendix 2.

Offline maps

Offline capabilities are an important requirement for the Travel Notebook. Access to maps is a challenge but there exist several solutions both for iOS (Apple devices) and Android. A list of offline map solution is given in appendix 2. Here we will only notice that Google Maps has offline functionality, although with some restrictions.

Google Now is in a category by itself. It is a personal assistant based on predictive search that tells you the things you need to know before you even know yourself. Based on your position (GPS), your habits, your calendar, and your email Google Now will suggest things for you that it thinks are relevant there and then. It is a glimpse into the future. Google Now will provide additional help and tips to your travel plan, although it cannot (yet) replace it.

3.2 Relevant services and tools – detailed descriptions

Stay.com is a website that permits travellers to explore more than 120 cities around the world and cobble together a loose itinerary connecting accommodations, restaurants and attractions at the destinations. A free iPhone app moves that functionality onto a smart phone and then saves much of it for offline use. New trips can be planned from the app and itineraries already designed on the website can be imported. The service features Facebook integration that, in turn, offers users the ability to collaborate with and solicit input from friends on crafting personalized itineraries.

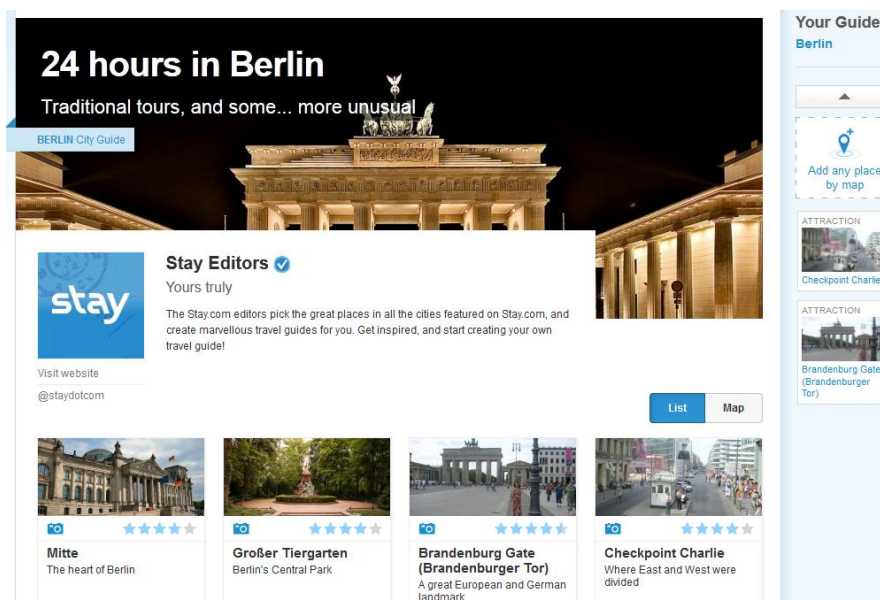


Figure 2: Screenshot from Stay.com's homepage

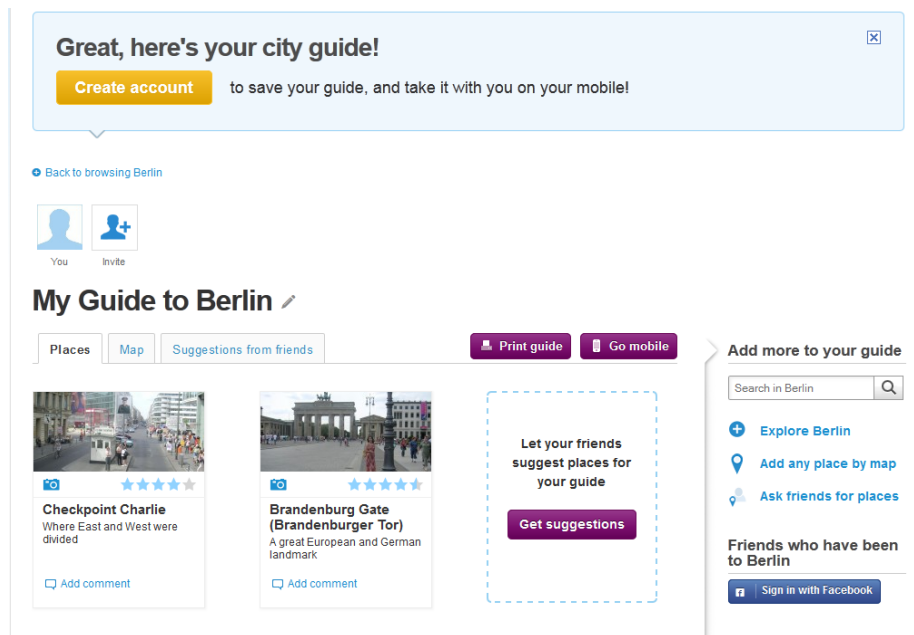


Figure 3: Screenshot showing details of Stay.com

CityTrip Planner provides an easy to use trip planner that can be personalized to suit travellers' needs. By answering some short questions about preferences including activities, interests, and hotels, a selection of items and an itinerary is proposed. Once the final selection is done, the tailor-made itinerary can be converted into a PDF or downloaded to a smart phone. As an API the key features are¹³

- Tailor-made, fully personalised, practical city trip itineraries
- Easy integration through use of affiliate-unique URL identifiers
- Implementation as easy as creating a text link

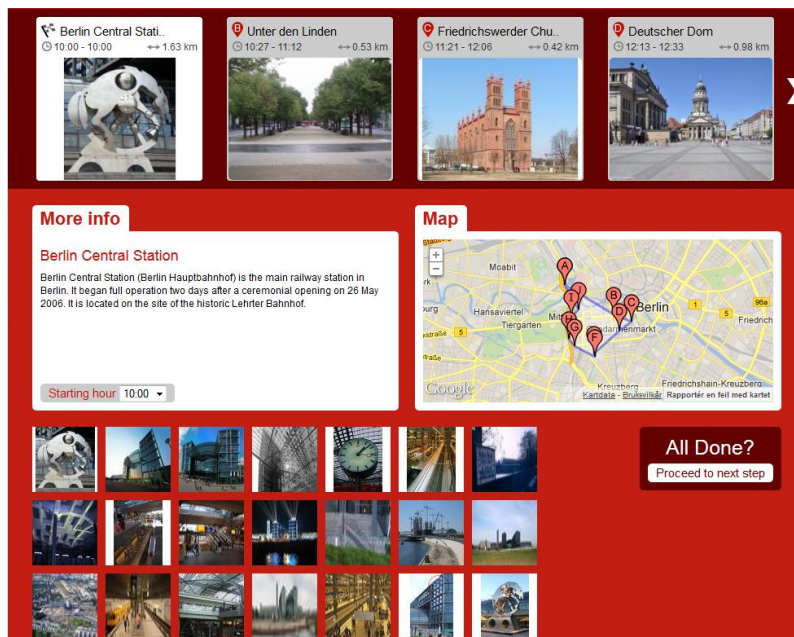


Figure 4: Screenshot from CityTrip Planner

¹³ <http://blog.citytripplanner.com/corporate/solutions/>

Go Pro Travelling is a web based application which automatically transforms an itinerary into an animated map that simultaneously displays multiple media, dates and transportation modes. It permits the day by day planning, determine walking distances to nearby places of interest or vehicle routes between destinations and search among 250.000 hotels worldwide. Its flexibility relies on the ability of direct interaction with the map and the freedom of saving all travel related information considered valuable.



Figure 5: Map from Go Pro Travelling

Plnnr collects and qualifies up-to-date information from the online sources. Scoring algorithms are used to find the best places for tours. It makes selection based on chosen preferences estimates the time needed to visit the places selected, but also asks the traveller. Each day has its own list of attractions and places to visit, with detailed information on each. The plan also has directions from one attraction to another. Itineraries can be printed or shared with friends, family and fellow travellers. Plnnr propose items to visit based on a relatively light expression of interest.

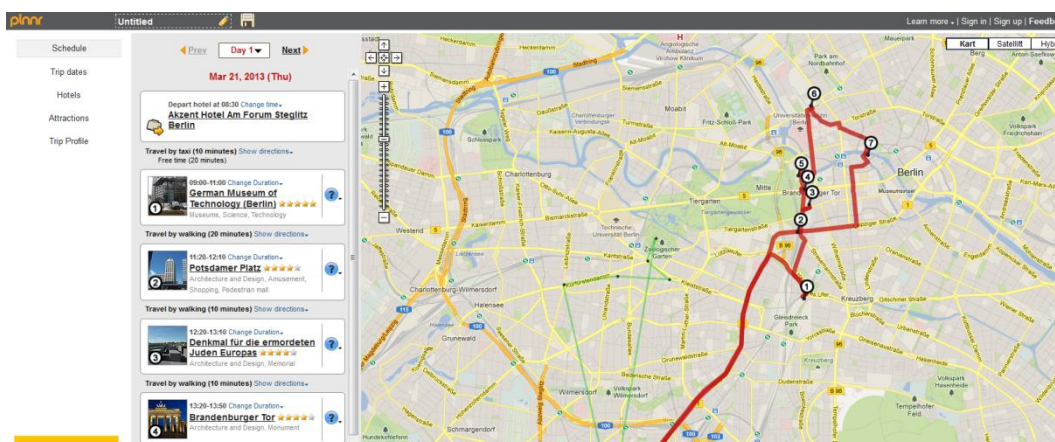


Figure 6: Plnnr's proposal based on Berlin -> 2 days -> The best of -> Moderate -> Popular

Traveezy is a website which allows the creation of customized itineraries in New York based on expressed interests. The inputs are travel dates and budget range and a selection of predefined

categories of interest - music, shopping, sports and bars. On the basis of this information a travel plan is generated. Each day is different and no travel plan will be the same. Traveezy is fuelled by user reviews, recommendations of the best and most unique things to do, via Facebook and Traveezy.com.

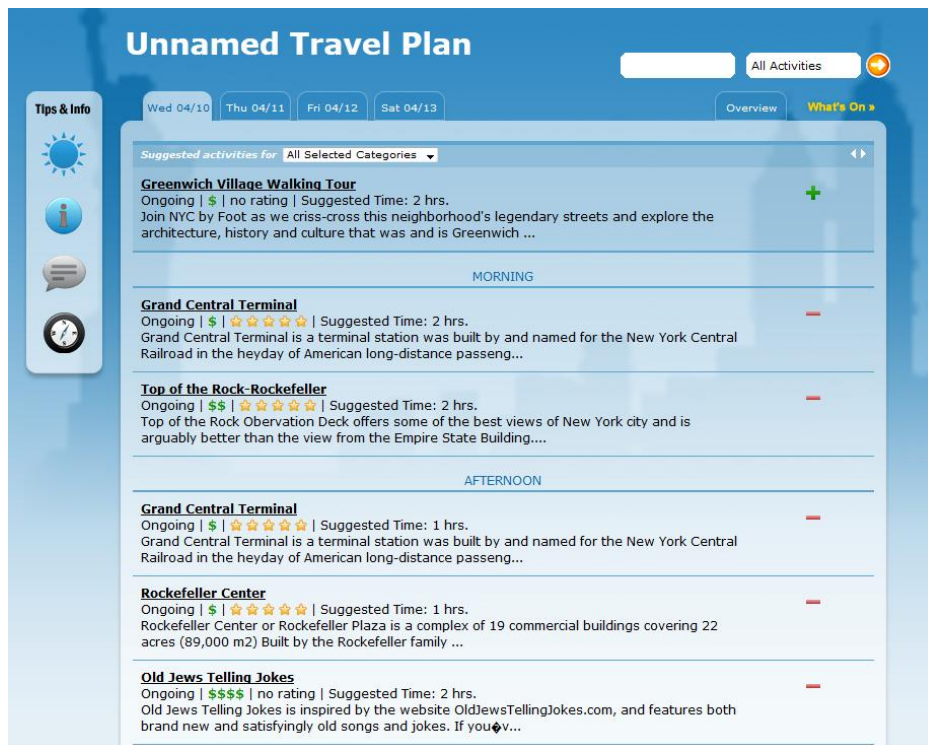


Figure 7: Choosing places to go in Traveezy

Voyajo offers two kinds of sessions

- Search trips (Recommended or Community) as requested by the user and display them on a dynamic map. The user will have the capability to decide the preferred 'Trip Route' and the option to extend or change the route.
- Plan trips top down with all its elements (Destinations, Places of interest, Day by day activities, Pictures, Videos) integrated on one website

The trip plan may be shared with the community and the community can add remarks, talkbacks and image files. 'Trip Summary' in Pdf format with all the trip components.

Triplt organizes all plans in one place based on the forwards of confirmation e-mails (flight info, car rental, hotel confirmation, etc.) to plans@tripit.com. Triplt collates them and builds an itinerary for the trip—accessible online or from a mobile device. The site will compile flight numbers, gate info, and other important items. Triplt also lets users check in online, get flight status updates, check the weather, and get driving directions; it is an open platform for the integration and organization of travel information from many different sources.



Figure 8: Triplt is available on many platforms

The Triplt API allows third parties to interface with this platform thus

- keeping all travel plans in one spot and stay organized with separate itineraries for every destination—ideal for frequent travellers
- giving access to trip details whenever and wherever you need them—on your smart phone, tablet or online at tripit.com
- giving daily weather forecasts, directions and maps for each destination
- providing map-based search to find restaurants, businesses and attractions, and add them to the trip itinerary
- syncing trip plans with calendar

Integrated with the travel planners are in some cases recommendations of accommodations, restaurants attractions and activities, in terms of ratings and reviews made by travellers, examples of which are

- Tripadvisor¹⁴
- Raveable¹⁵
- Wanderfly¹⁶

Yahoo! Trip Planner

The Yahoo! Trip Planner lets the users plan, browse and share trips. It is working closely with the Yahoo! Travel Guide and all itineraries of the Travel Guide can be added to the Trip Planner by clicking a button. This is the same way we envisage the Travel Notebook's integration with local and regional tourism websites.

¹⁴ <http://www.tripadvisor.com/>

¹⁵ <http://www.raveable.com/>

¹⁶ <http://www.wanderfly.com/>



Figure 9: Screenshot of Yahoo! Trip Planner's home page

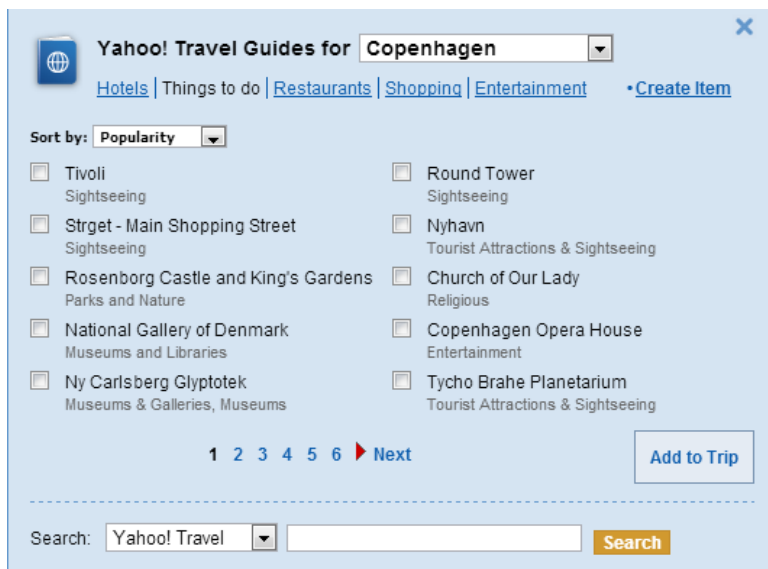


Figure 10: Details of Yahoo! Trip Planner

The Yahoo! Trip Planner also lets the user organize the plan and print it out. It also features a diary function that lets the traveller turn the plan into a presentation for family and friends. YTP has two REST based webservices, *Get Trip* and *Search Trips*, that let's developers query the plans and import details either in an XML or a JSON format. The APIs can only be used for non-commercial purposes.

3.3 Supporting services and tools

Tripadvisor is not covered in the overview of trip planners although it is an important tool and part of the planning of many travellers. It powers most of the recommendations found in the guides and planners listed here. It holds a collection of reviews and evaluations of accommodations and attractions worldwide that are presented on may sites (tripadvisor.com, hotels.com, booking.com ++).

Summary of existing services and tools

There exist a vast amount of travel planners and we have only covered a tiny bit. We have tried to isolate the most interesting seen from the Travel Notebook's requirements and needs for integration, and described them in more detail.

The main problem with the planners described is the lack of an API for integration into other tools. The Norwegian **Stay.com** is interesting both because it is based in Norway but also because of the way it is designed and the integrated app solution. We suggest to contact Stay.com to find out whether the things missing in their tool and needed in a Travel Notebook, can be solved via Stay.com.

Of the other tools listed, **Triplt** and **Yahoo! Trip Planner** looks the most promising because of the APIs they provide. It should be possible to integrate to both these tools and a further work on the Travel Notebook needs to investigate this possibility.

4. Existing tellUs infrastructure

tellUs is the hub of the digital product marketing effort of Norway as a tourist destination. It provides three groups of services under the heading Guest Maker (GM)¹⁷

- GM Information
 - Destinator
 - Rating
 - Portier
 - Interface
- GM Booking
 - Online sales
 - Onsite booking
- GM Distribution
 - Interface

4.1 GM Information

GM Destinator is the product database, the information bank for the destinations that are tellUs's customers. It is the basis for a number of different media and channels, for example Web sites, brochures and printed materials, mobile portals, tourist information kiosks, the GM Portier tourist information representation, and channels such as VisitNorway.com, Google Maps, Eniro etc. The information, published by the DMOs, is of varying quality. There is ample space for improvements.

GM Rating provides guest ratings and reviews in the TripAdvisor style. It is a system for receiving and distributing the users' own experiences of the various products contained in GM Destinator.

GM Portier is a search tool for information stored in the GM Destinator product database to support the tourist information offices in answering questions from tourists. The information can then be printed out or e-mailed directly to the tourist in his or her own language.

GM Interface Search is an API to create menus, searches, product lists and product presentations for the Web applications as well as other channels such as printed materials, mobile portals, digital display or tourist information/surfing kiosks. It is supplied as a type of plug-in technology leaving open design decisions.

4.2 GM Booking

GM Booking is a dedicated interface for efficient booking of accommodation and activities at the destination that provides

¹⁷ GM Destinator is the information source for FjordNett (CMS)

Rating is not used in fjord Norway region

Interface is used by FjordNett

Portier is used by tourist offices

GM Booking is only used by the destinations, not by the regional destination (Fjord Norway)

- automated communication of available capacity from businesses (replaces current fax/mail solutions)
- overview of all available capacity in one screen
- online booking direct from the tourist information centre
- option for tourist information centre or company to take payment
- automated calculation of commission

Online sales contains the functions needed to be able to present, book and pay for products online. Products in this context are Accommodation, Activities, Attractions and Events - and packages of these. Online Sales is available for use by tourism companies, destination companies or tourist boards such as Fjord Norway or Visit Norway.

Onsite booking can be mixed and matched such that visitors can book products individually, in combination or as packages. The large individual differences between booking, for example, a mountain cabin and a town-centre hotel are accounted for.

4.3 GM Interface

GM Interface has the technology to facilitate high-quality and straightforward distribution. The following sections provide a technical breakdown of the programming interfaces in GM Interface:

- The **Search** API is used to collect information from GM Destinator in real time and can be incorporated into various solutions.
- The **Feed** API is intended for larger portals, ideally national or international portals that need to integrate information from GM Destinator in their own systems. This is a pure export function that allows full extraction and amendments/updates. The API is a Web service and outputs XML.
- The **Booking** API is used by portals and applications that wish to develop their own user interface for booking of bookable products in GM Destinator.

tellUs also provides services of interest for the DMOs, i.e. statistical information on booking and visitors, and reports. The web service at <http://statistics.tellus.no> gives a number of statistical information, e.g. the number of product views in given period.

GM Booking contains information about the guests: who they are; what they are interested in; where they are from; what they are paying etc. Among other things this information can be used for marketing campaigns targeted at various segments. The information can be used to provide repeat guests with extra/special service. There are many opportunities for further improving how to look after guests. The system also contains a set of standard reports for both destination companies and providers. The standard reports contain everything from arrival lists to sales overview for various channels with associated financial agreements.

GM Destinator and GM Interface constitute a content management system (CMS) used by many destinations. Other destinations like FjordNorge and partners use EPiServer CMS with content transferred from GM Destinator by XML.

Summary of the existing infrastructure

tellUs is the main tourism information provider in Norway and powers the destination websites of Fjordnett. A Travel Notebook tool needs to be tightly integrated to the tellUs data repository since this is where most of the tourism information originates. At the same time tellUs is of a great need to reorganize its data in order to serve future requirements (Hove and Ølnes, 2011)

5. Requirement specification

This chapter summarizes the input from the previous chapters into a set of requirements for the Travel Notebook. As the TN will serve as a tool both for travellers and for the tourism sector (the DMOs), as well as being a source for others to tap into, it will have a multi-faceted appearance. But the most important requirement is that it needs to be a good tool for the travellers.

5.1 Traveller requirements

From the traveller's user scenario, the user survey, and the survey of existing tools as well as the preliminary plans for the TN, we outline these main parts of the service seen from a traveller's perspective reflecting that a holiday trip normally is divided into

- travelling to a destination
- making a round trip within the destination including excursions
- travelling home
- establishing a travel diary (organising photos, videos etc.)
- sharing the experience with friends and family

Planner

This is the key part of the TN service and it has to support the traveller in planning the trip. It needs to interface to tools, like *Triplt*, in order to minimize duplication of effort and to let the users use their favourite tools. Additionally, the traveller should be able to plan the journey route by car or public transport.

The traveller also needs to be able to add new products to the planner, and schedule them using some sort of calendar, preferably integrating with an existing system.

The planning must allow for two levels, the planning of a round trip hinging on the selection of places to stay and the travel between these, and the planning of activities at each of the places with the natural specification into day plans. The round trip as well as the day trips should be represented on maps with automatically generated itineraries determined by the selection of products.

The planner must assist the travellers in all stages of their trip, whether it is in Western Norway, Norway or another country.

Guidebook

The complete plan will function as a guidebook and has to be available offline during the trip. The traveller must be able to edit and change the plan all the time, regardless if being online or offline. The complete plan must also be ready for print.

Diary

The diary part of the TN will essentially also be the (completed) Planner, with the addition of uploaded photos, videos, and notes. The traveller also should be able to make comments, ratings ++

either during the trip or also after the trip. The diary is mostly planned as a presentation of the trip to family and friends afterwards, maybe also available to anyone if the traveller wishes so.

Virtual concierge

This is where the traveller and the DMO meet. From the traveller's point of view it would be very helpful to get in contact with the DMO during the planning phase and also possibly during the travel. All things taken together, **the Travel Notebook is a travel planner first and last**, and with some smaller additions and customization it will also function as a guidebook and diary.

Table 15: Main parts of the TN seen from a traveller

Sections/functions	Functions	Content	Structure	Views
Planner	Selector/ add to plan	Places and products	list of products and places, descriptive text, links to websites	web interface/ mobile interface
Plan/Guidebook (offline data)	Geolocated with map	Selected places and products	scheduled plan/ thematic menu	Web/ mobile interface/ print
Diary	editor	Edited content	scheduled plan/ thematic menu	web interface/ mobile interface/ print
Virtual concierge	Extended user support (active)	Re- commend. (manual) Recommend engine (aut.)	DMO must be able to comment on plan	FAQ, e-mail/messages, chat, aut. recomm.

The main sections Planner, Guidebook, and Diary all have to be available both online and offline. Also the planner needs to be available offline and the traveller be able to edit the plan. Of course, external resources outside the plan will not be available in offline modus. The virtual concierge section is where the user and the DMO meets, therefore this functionality is listed both in the traveller's view of the TN and the DMO's view.

5.2 DMO requirements

Based on the DMO part of the user scenario and NCET's ambitions rooted in the knowledge of the DMOs' requirements, we see these features as the most important:

- detailed knowledge of planned "products" well in advance (the user survey tells us that travellers on average start to plan their holidays more than 3 ½ months before they travel)

- a direct channel for dialogue with the traveller, with the possibility to give support in all phases of the planning and on the trip itself. Each traveller could be assigned his or her *concierge* who will follow them, digitally, through the whole trip
- overview of feedback and ratings from the travellers
- a channel for follow-up questions after the trip (for, among other things, conducting short surveys)

Table 16: Main parts of the TN seen from a DMO

Sections/functions	Functions	Content	Structure	Views
Analytics	Analyse user data	Aggregated user data	Structured lists of products	XML or other export format
Direct support	Answer user questions sync./async. (reactive)	Individual support and FAQs	Questions and comments Chat	System for asking questions and chat
Virtual concierge	Extended user support (active)	Recommendations (manual) Recommendation engine (aut.)	DMO must be able to comment on plan	Same as user's view of plan

The DMO requirements are thus related to extracting information about user preferences that might be useful with respect to deciding the improvements of the products and for settling the marketing strategy.

Virtual concierge

The Travel Notebook will give an unprecedented opportunity to support and guide the traveller through all stages of the planning process and to advice the traveller during the trip. This feature should be thought of, and planned as, a *virtual concierge* where a representative from the DMO follows the traveller in all stages of the trip. This is the meeting point for the traveller and the DMO.

This part could be made payable in such a way that simple questions and advice will be free (the digital tourist office function), while a personal digital concierge could be paid for. From the DMO's side this will be an important part of an overall CRM system (Customer Relation System) and should be integrated with special purpose CRM systems.

Once the DMOs get a view of the plans for the travellers they can also suggest other attractions or activities based on this. Let's say a traveller has planned to drive from Sogndal via Luster and to Gudbrandsdalen, without making a stop in Luster. It would then be natural for the DMOs' to carefully give some advice on what Luster has to offer and that it deserves a day or more extra in order to get a much more interesting trip. The virtual concierge has the potential to be further developed in the

direction of a recommendation engine. Simple features like “travellers who stayed in Sogndal also visited Anestølen” would be relatively easy to add. More advanced features could be planned for later versions of the Travel Notebook.

Product listings

The DMOs can access the Travel Notebook at any time to see its inventory list, that is the products (and places) which the travellers have added to their plans. Of course, this requires the consent from the traveller. **Privacy must be ensured** and travel plans depersonalized if consent is not explicitly granted.

If the Travel Notebook is used by a lot of travellers it will give the local tourism industry a major benefit in planning the season. Their knowledge of the coming season will be on a new level, and could be a real game changer for the industry. A substantial use of TN would make a very good tool for catching trends and changes in preferences at an early stage.

Evaluations, comments, and ratings

The traveller will be able to make comments and ratings about the different products he/she experiences, as well as a feedback for the whole trip. In addition the DMOs can use the Travel Notebook data to send short surveys after the trip to collect essential information from the traveller (for instance the same way Booking.com asks you a few questions about your latest stay).

However, we should not rely too much on features like rating of products. After all there are many established rating services in the tourism sector already (TripAdvisor, Booking.com just to name a few big ones) and thinking that we can get the travellers to invest time and effort in rating on yet another platform could be naïve. Rating and feedback should therefore be built into the diary and integrate well with existing rating sources.

Combination with other sources

However, the Travel Notebook should not be THE solution to supersede all other solutions. Rather it should be planned as a complement to other tools and services. Data from TN must be analysed and compared to web analytics (including ads), and integrate with business intelligence systems.

Summary of the requirement specifications

- the planner part of the Travel Notebook is key part and should be given the highest priority
- The *virtual concierge* feature has the potential to be a very important part of the planner and at the same time give the DMO's an unprecedented opportunity to know the travellers and help them get the most out of their stay.
- the virtual concierge could be a service which the travellers could be willing to pay for and it could be extended from a manual service to a more automated service with time.

6. Architecture for a Travel Notebook

6.1 Key requirements for the architecture

The background information in this report combined with previous work has given us an understanding of the critical success factors the Travel Notebook needs to be built on and that the architecture must reflect:

- Reuse of services and information
- Flexibility
- Openness
- User orientation
- Robustness
- Security and privacy
- Phased development
- Multi-platform (responsive design, support for a whole range of devices)

Reuse

One of the most important aspects of the TN and its success will be the way the service is able to reuse existing services and information. TN is all about integration in order to minimize the development of new features. However, as our survey in chapter 3 shows most of the interesting services available today do not have an open API to fetch data from.

Information should flow both to and from the TN. Much of the information held in the TN will be CRM information and should be integrated to special purpose **CRM systems**. The aggregated data will serve as a basis for **business intelligence analysis**.

Flexibility

The tourism industry is one of the industries that is most dependent on the Internet. The development of online services for the travellers and the tourism industry has been nothing short of revolutionary. The Internet has been a game changer challenging much of the established structures and organizations. Recently the development in services for mobile use has taken off and led to new possibilities, but also to new threats.

When developing new online services on a fast spaced place like this it is extremely important to have a constant view on the rear and side mirrors in order not to be run over. The Travel Notebook needs to be designed from ground on to meet these challenges and to be able to integrate yet unknown services and information, and also be able to adapt to new trends by the users' use of online services.

Openness

The web and the Internet is all about openness and the latest years of development has shown that in the long run it is probably best to plan for openness. This is the way the Internet was meant to be, and we should support that. Also the Travel Notebook is dependent on open interfaces in order to maximize reuse, and should also be open towards other possible users. The move from web services

with the relatively closed SOAP principles to today's prevalent RESTful architecture can be seen as a victory for the open strategy and a move back to the core web building blocks; like the HTTP protocol.

User oriented

We must never forget that the Travel Notebook will be designed and developed **for the traveller first, and then for the DMOs**. Of course the motivation for building the Travel Notebook is to attract more visitors and to get to know more of their plans in advance. But in order to succeed with this, we must have the traveller in mind all the way through the development.

Robustness

The Travel Notebook needs to be designed in a robust way so that it can handle also unexpected situations and open up for use that we did not think of when starting the development. This is closely tied to the flexibility and openness aspects, but adds its own flavour by emphasizing the unexpected side and the error handling.

Security and privacy

It is a major challenge to balance flexibility and openness with security and privacy, but it needs to be done. Since the travellers need to be authenticated in order to save their plans, there is automatically a security issue and a privacy issue. The Travel Notebook needs to be designed so that it is secure for the travellers and the privacy issue needs to be addressed in a way that makes it very clear that the traveller is the one that decides whether any information from the plans should be shared to others, including the DMOs. Of course, the DMOs need to be able to generate aggregated data from the Travel Notebook, but will need informed consent from the traveller in order to look at individual plans.

Phased development

The development of a Travel Notebook will need to reduce risks as much as possible. One way to reduce risk is to break the whole development project into smaller manageable modules that can stand on their own and offer sufficiently functionality for the user(s)

Multi-platform

The Travel Notebook will be used on a variety of platforms like pc's, tablets, and smart phones. The design needs to reflect this, and a responsive design will be an absolute requirement. The online/offline dimension of the service will also be important, and we think the possibilities of HTML5 in this respect should be considered before starting to develop an app.

6.2 The architecture from a bird's view

SOA and REST

We see the Travel Notebook as a service with which the users (travellers and DMOs) interact, and a service that integrates with several external services with various degrees of depth. The Travel Notebook should be envisaged as a virtual service and not as a website. That way we separate the

graphical user face(s) (GUIs) from the core services. Furthermore, we should think in an **object oriented way** when looking at the Travel Notebook. First we describe the object seen from the outside, and how to communicate with it (Figure 13 and Figure 13 and WP 2 in the next chapter). Then we look at the inner workings of the object and how it is built (Figure 14 and WP 3 in the next chapter). This helps us separate the communication with the service from the internal logic and workings. The core services of the TN will be based on a service-oriented architecture (SOA) and the communication with the TN from outside resources should be based on RESTful web services.

A RESTful architecture means that the service and the interaction with it must be build on the core web protocols and standards: HTTP and URIs. Calls to the TN should be based on HTTP methods (GET, (HEAD), PUT, POST, and DELETE) as far as possible.

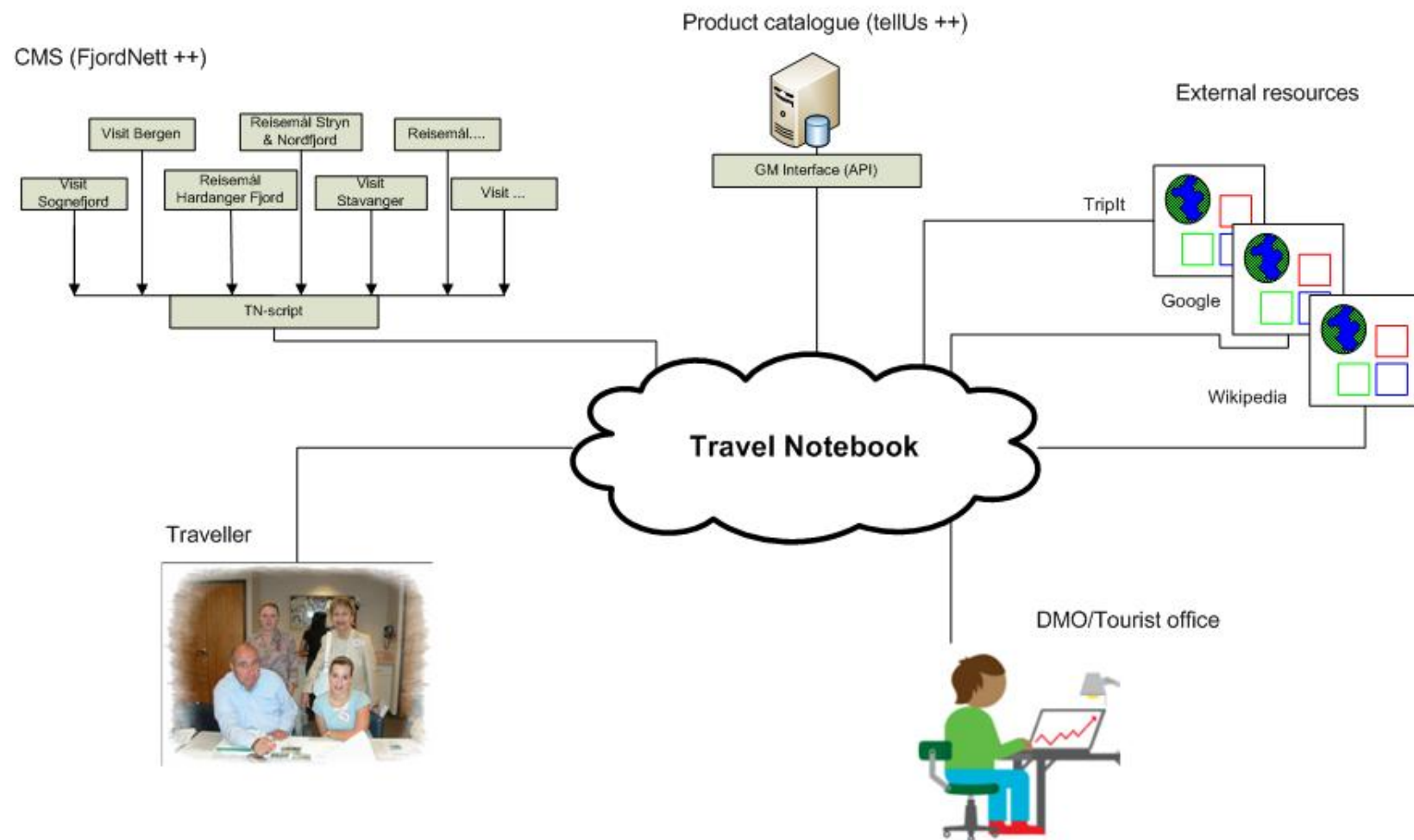


Figure 12: Conceptual drawing of the Travel Notebook

The Figure above gives a conceptual overview of the planned Travel Notebook. The important aspects are the interfaces to users and other services:

Traveller interface

Travellers can interact with TN either through an integrated tourism website (e.g. VisitBergen.com, Sognefjord.com) or directly through a separate user interface involving a login procedure. For the authentication procedure (login) a range of existing systems must be supported, e.g. a Google account, a Facebook account, a Twitter account ++. This can be achieved using the OAuth 2.0¹⁸ protocol.

Once logged in, the travellers gets access to their travel plans, if any, and can manipulate it according to their own needs. The traveller should also be able to invite friends to look at the plan(s) and be able to receive tips from friends in the Travel Notebook.

DMO interface

The DMOs will have a separate interface for interacting with TN. It will consist of both an analytical view of aggregated data as well as the possibility to access individual plans if the travellers' have given their consent. Through the DMO interface the staff at the tourist office or the product owners themselves can establish a dialogue with the traveller, establishing a feature we can call the *virtual concierge*.

There should be both a common part seen by all users of TN that contains FAQs and other tips and advices, as well as a way of communicating with each individual traveller, for instance by a chat feature in addition to general email.

CMS and CRM interface

The CMS interface will from the start be a special integration for the websites that constitute FjordNett today, since FjordNorway is the present owner of the Travel Notebook. In the longer run, all tourism websites that wishes to integrate TN should be able to do so. The business model for this is outside the scope of this project, but it is important to design the architecture with this in mind and not put unnecessary limits on the TN service from the onset. The CMS interface will be bi-directional; users will add information to their plans and they will be able to access their plans from within the CMS.

The information gathered in the TN is really CRM data. The TN should be thought of as an extended CRM system and the integration to special purpose CRM systems will be important. Privacy and security will be important issues regarding use of the CRM data.

Product catalogue interface

At present this is tellUs for all practical purposes, but when designing the CMS interface it is important to make a general interface that is provider neutral. An interface from tellUs to TN will use

¹⁸ OAuth 2.0 is an open standard for authentication (RFC 6749). OAuth is complementary to, but also distinct from, OpenID. NB! OAuth is also distinct from OATH which is a reference architecture for authentication and not a standard. Facebook, Google, and Microsoft are among the vendors supporting OAuth 2.0 (Wikipedia.org).

today's web services from tellUs to make queries into the product database. These are built on traditional web service technology (SOAP and transfer of xml).

A key question to this part of the Travel Notebook is whether the products should come from the CMSs or the catalogue providers. The best would be to import product information from the product catalogue providers because these will be highly structured data. However, it must also be possible to import data and information from the CMSs even if some or all of the structure then will be missing. There is also the additional context issue; a product presentation at a tourist website (called CMS here) puts the product in a context. A direct import of the product from the product catalogue will miss the context, often crucial for the understanding. It should thus be possible to also include descriptive text in addition to the products.

External resources interface

External resources are here defined as resources that are outside NCET/FjordNorway's reach in terms of direct influence. They are resources which NCET/FjordNorway do not control or can influence in any way. Integrating information from external resources must be accomplished through the resources' own APIs. If no API exists the lowest common integration interface is the hyperlink (e.g. linking to the resource).

One of the most important requirements for the TN will be the ability to reuse existing services and information. The interface for integrating external sources therefore needs to be flexible and must adapt to a range of APIs. APIs can range from traditional web services serving xml, to RESTful APIs serving xml or json, and to semantic based APIs like Linked Data, serving rdf. There are also other possible formats like RDFa and microformats found inside HTML code.

As we showed in chapter 3 in our survey of existing services and tools, most of the interesting services come without a specified API and will be hard/impossible to integrate into TN. This will probably be the biggest challenge. However, aside from the tailored services there are other useful services of a more general character like e.g. Wikipedia (accessed through its semantic version DBpedia) and dit.no which holds information about roads and public transport in Norway.

6.3 The core of the Travel Notebook

The core of the Travel Notebook will hold the product inventory, the calendar for the trip and other resources picked by the traveller, as well as general info (FAQs ++) concerning all travellers to the region. The core should be modelled with a service-oriented architecture in mind and TN seen as a service provider for its users (travellers, DMOs, other users). The Figure below shows how the core of the TN is planned:

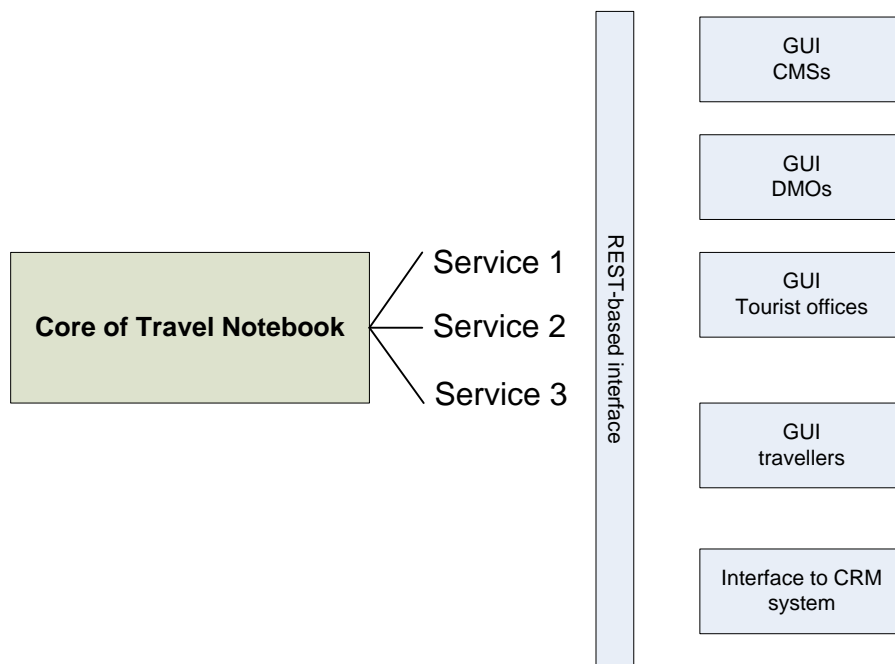


Figure 13: How different systems access the services in the Travel Notebook

The core of the Travel Notebook will be designed using a service-oriented architecture (SOA). That means (1) all functions should be designed as services, (2) that all services are independent and all one needs to know is how to ask for data (query) and how it will be returned, and (3) that the interfaces are invocable, that means that their location (local, global) is irrelevant. In SOA the interface is the key and it is the focus of the calling application¹⁹.

Levels of integration

Websites will have different levels of integration with the Travel Notebook. The websites of FjordNett (or more general: tourism websites that want a deep/full integration with the Travel Notebook) will need a piece of code (Javascript) embedded on their sites in order to let the travellers add products to their plans. The different levels of integration are illustrated in the figure on the next page.

A key requirement is the ability of the TN to assist the traveller on the whole trip, whether it also includes other parts of Norway or even other countries. Here is where the shallow integration comes in. It is essentially just links to places, activities, attraction and so on and the possibility to integrate it to the existing itinerary.

¹⁹ Kishore Channabasavaiah, Kerrie Holley, and Edward M. Tuggle, Jr., IBM: "[Migrating to a service-oriented architecture](#)"

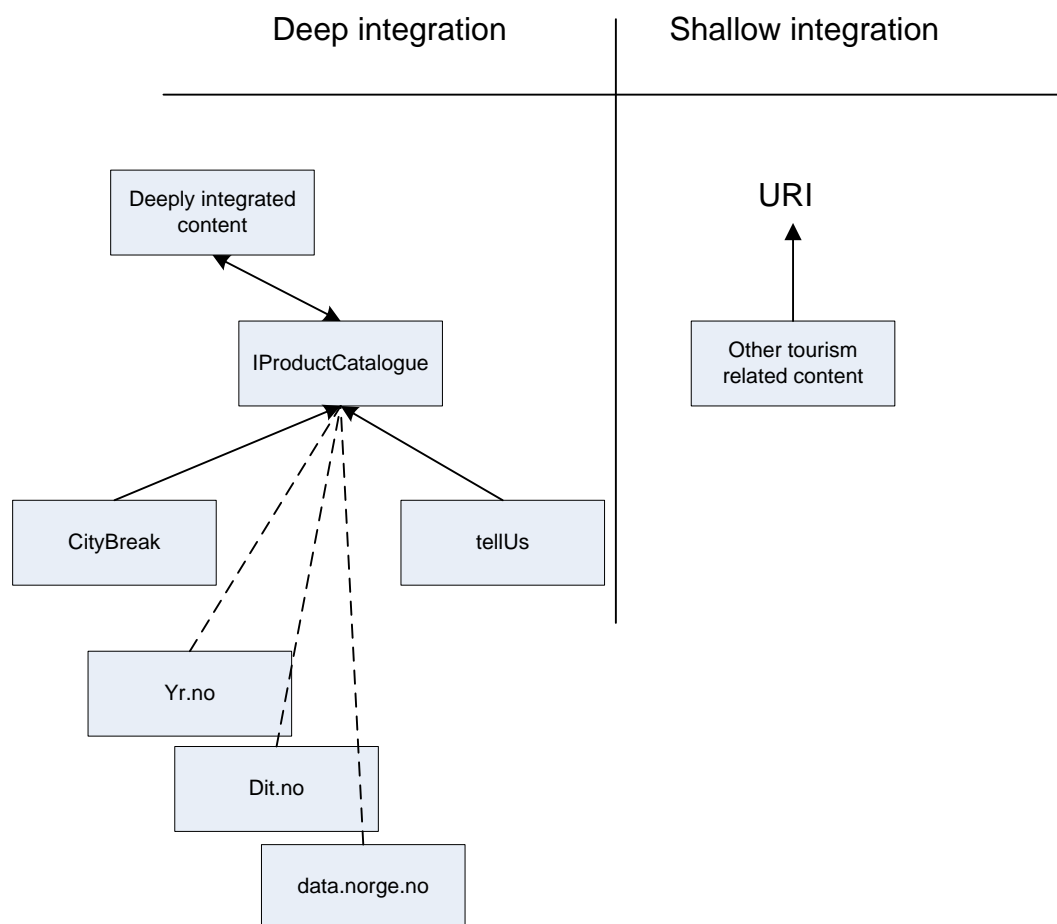


Figure 14: Levels of integration to the Travel Notebook

Integration seen from the traveller

As mentioned previously the traveller can either access the Travel Notebook from a tourism website with a TN integration, or directly by logging in to the traveller's account on TN. Accessing the TN via a tourism website will look like the Figure below. It is a use case drawn from the user scenario in chapter 1:

"He activated the planning function on the tourism web site of Western Norway, made a selection of attractions and activities, registered to open an account on the site and saved the selection on the account."

The user (traveller) goes to Sognefjord.com, looks up the information about the Urnes stave church and clicks the button labeled "Add to Travel Notebook" (or "add to trip"). Upon the click of the user, the activated Javascript module selects the product "Urnes stave church" and adds it to the inventory list of Travel Notebook. If the user is already logged in, it is automatically added to his/her list of products, if not, the user is asked to log in or register upon ending the session at VisitSognefjord.com. The information (product details) can be transferred from VisitSognefjord.com to TN, or TN can get the product information from tellUs which is the primary source for all product information in the websites of FjordNett. This is a question that needs to be answered later and have to be discussed between FjordNorge/NCE Tourism and their data provider tellUs. The best thing would be to fetch

the products from tellUs instead of the remapped FjordNett websites, but that will probably require a better information structure than tellUs' present one.

ACCOMMODATION - DINING >> UNIQUE PLACES TO STAY

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Figure 15: Use of Travel Notebook from a tourism website (the user clicks a button labeled "Add to travel plan")

The Figure above shows Northern Norway's travel planner implemented on their website²⁰. This is a very simple planner that stores a copy of the pages you add and let you view them and print them (as a pdf file). As a travel planner it is very rudimentary, but it serves here as an illustration of how the 'Add to travel plan' will appear on websites closely integrated with the Travel Notebook.

Manipulating the Travel Notebook information

The user (traveller) can organize the content of his/her TN account (= the plan) in various ways. The most obvious way of organizing the information about the trip is by time and location, i.e. with a calendar and a map view. An example of the map-based view is given in Figure 16 and Figure 17. In addition to the products added through deeply integrated websites the traveller also can add resources that are not integrated with the TN simply by adding links and description. This may sound trivial but is actually very important because it defines the user orientation of TN and the flexibility that is needed for a system like this to be used. The Travel Notebook has to be built as a tool for the traveller to assist him/her on the whole trip. That means the service cannot stop to function once the

²⁰ www.nordnorge.com

traveller is outside FjordNorway's region, or outside Norway. To be useful the Travel Notebook needs to comprise the whole trip, whether or not the tourism websites along the route are integrated with TN. Therefore the TN must be built with the possibility for the users also to add their own resources, no matter where they are found. The Travel Notebook must support the whole trip, or else it fails as a complete planner.

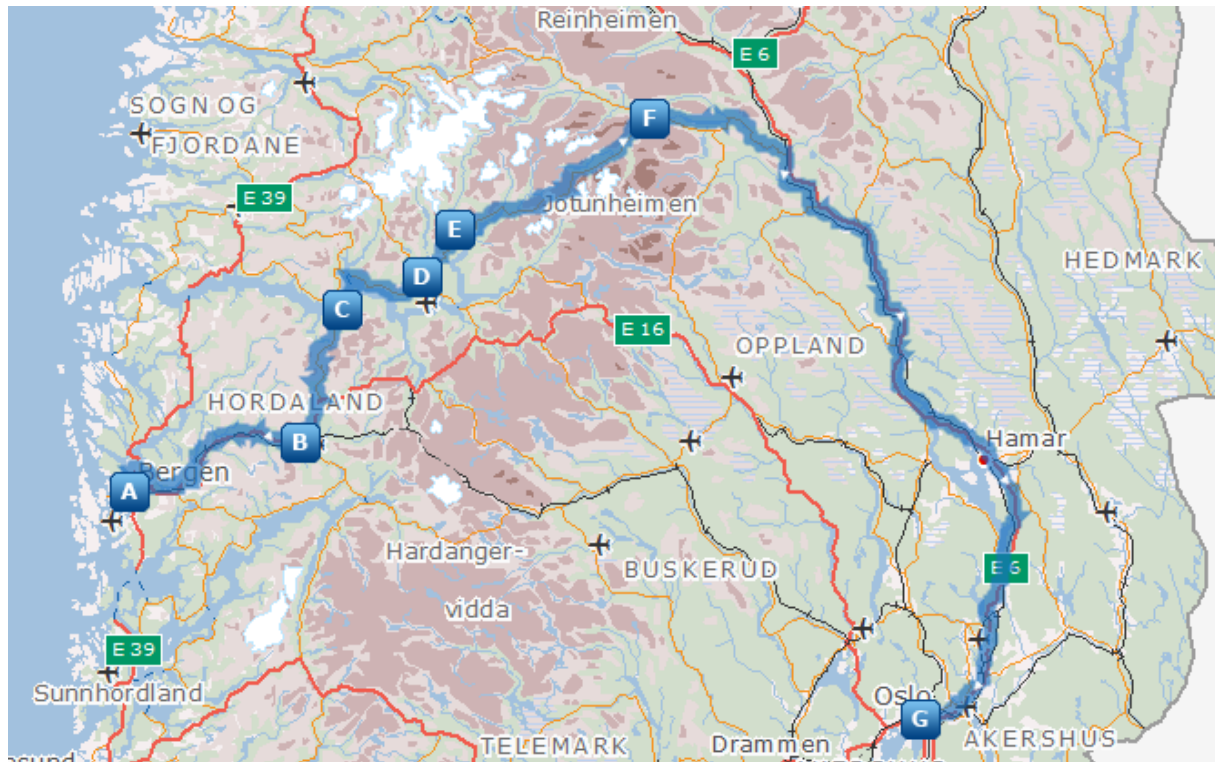


Figure 16: Planned route from Bergen to Oslo via Sogn and Gudbrandsdalen (VisitNorway Explore Map²¹)

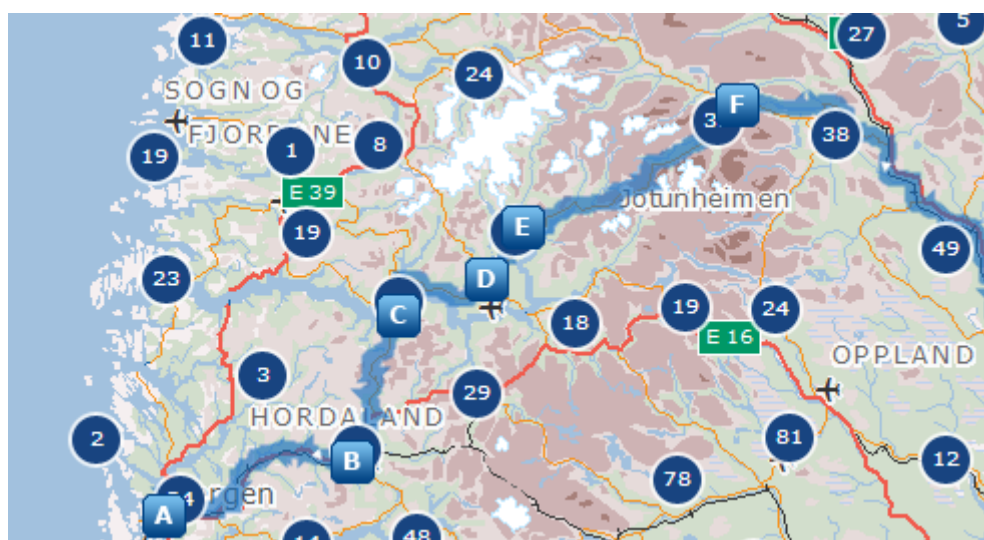


Figure 17: Suggested places to stay along the route (VisitNorway Explore Map)

²¹ <http://www.visitnorway.com/map>

VisitNorway's map based planner is a good start and a good example of how to organize the product list in TN in a geographical way. In its present stage it is not precise enough, but could be due to insufficient information in the data itself. It should be possible to cooperate with VisitNorway to integrate this map-based service with the Travel Notebook. In preparing the development project, an important task will be to evaluate existing solutions (like CMSs) to see if they can meet some or all requirements for manipulating the TN content.

DMO's view of the Travel Notebook information

The DMOs will have access to aggregated information from the Travel Notebook, and possibly the individual plans. The aggregated data will serve as a starting point for business intelligence methods of analysis. The aggregated information should be presented using a dashboard like interface, or could be accessed in an existing business intelligence suite. For presentation purposes there are several existing solutions for this, either full-fledged dashboards like for instance GeckoBoard²², or more generic graphical solutions like the Norwegian HighCharts²³. The degree of flexibility and control over data should decide what type of tool to use.

Product inventory and Internet of Things

In order to take advantage of one of the strongest development trends on the Internet today, the semantic web/linked data, we propose to model the core repository of the Travel Notebook according to the Internet of Things (IoT) paradigm, at least for a future version. The IoT paradigm, described in detail in appendix 3, lets all physical things of the world have their unique representation on the Internet in the form of a URI. This way we move "from strings to things" and we will know what we are talking about and what the travellers are planning. We will know that 'Urnes stave church' in fact is a stave church, and we can easily count all the planned visits to this and other stave churches in the region. More important, we will be able to share information from different sources about the same thing. When modelling according to IoT we can be sure we are talking about the same thing even if the sources are different and even if the name of the things differs in spelling. This part of the project is the most future-looking and should be suitable for a further research project.

Summary of the architecture chapter

- The overall model of the TN is best understood in an object oriented way
- The Travel Notebook must be based on a service-oriented architecture (SOA)
- The dialogue with the TN must be REST based web services
- There are multiple interfaces to the TN (traveller, DMO, CRM, CMS, external services)
- There must be different levels of integrations to the TN (from deep to shallow)
- The TN must meet all the needs of the traveller and cannot be restricted to (Fjord)Norway

²² www.geckoboard.com

²³ HighCharts is a product by HighSoft Solutions, a small ICT company from Vik (Sogn) with a global customer base

7. Research and development plan

The Travel Notebook as outlined in the previous chapter will be a bold initiative with possibly complicated research and development tasks. It is therefore of paramount importance to describe ways to reduce the (economical) risks.

7.1 Identified work packages

To get an idea of how many resources the development of the Travel Notebook will need, it is necessary to break down the development of TN in smaller and manageable parts (work packages) and try to estimate the costs of each.

Phased development

To reduce costs and risks it is important to develop the least ambitious parts of the Travel Notebook first, and gain experience before starting on the more advanced parts.

The parts of the TN that can be reduced or simplified, are especially:

- reuse of frameworks for the base architecture
- the TN inventory manipulation

These simplifications will affect the development of both the travellers' and the DMOS' interaction with the service.

We propose a development plan that follows these steps:

1. The **planner**

- start with a simple "wish list" for the traveller (but the architectural foundation must be in place)
- move on with a more elaborate planner with more integrations
- end up with a complete route planner including routing, calendar integration, calendar view and map view

2. The **guidebook** will be the final plan turned into a pdf file

3. The **diary** – our survey shows that this feature is the least wanted and it can be put on hold

Table 17: Stage based development of the core TN

Sections/functions	Stage 1	Stage 2	Stage 3
Planner	“Wish list”	Addition of simple planning	Full-featured planning tool (calendar and map-based)
Plan/Guidebook (offline data)	Offline accessibility PDF of Planner	Offline accessibility PDF of Planner	Offline accessibility PDF of Planner
Diary	Not impl.	Simple notes	Notes, ratings, photo sharing
Virtual concierge	FAQ, email	Chat, recomm.	Recommendation engine
DMO analysis	Simple prod.lists	Ext. analysis, dashboards, simple business intell.	More complete business intelligence solution
Resources (mm ²⁴)	2,5²⁵	4,5²⁶	6,5

With these adjustments, affecting mostly WP 2 and 3, the needed resources can be reduced by an estimated 4 mm (ca 600 000 NOK). Where the resource estimates have a range, it is because of the stage based development.

WP 0: Project management

	Time (mm)	Costs (in 1 000 NOK)
Estimated time and cost for WP 0	2	300

WP 1: Detailed requirement specification

There is a need for a more detailed specification of the requirements based on the conceptual framework presented in this report. The specification will serve as a basis to invite tenders.

	Time (mm)	Costs (in 1 000 NOK)
Estimated time and cost for WP 1	2	300

²⁴ mm = 1 man-month

²⁵ Stage 1 also comprise developing the open architecture foundation

²⁶ An important part of this phase is the DMO and a simple “business intelligence” part

WP 2: Base architecture and interfaces (see also Figure 12 and Figure 13)

The base architecture of the Travel Notebook as outlined in Figure 12 is the foundation and as such an absolute necessity. The first question that comes to mind is whether there already exist frameworks that can be used so as to avoid unnecessary coding. But even if it is possible to start with an existing framework there will be considerable coding in order to establish the core service and its interfaces. The first task will be to check available frameworks against the requirements specified in this document and detailed in WP 1 to see if reuse is possible.

Tasks:

- Evaluation of possible frameworks: 0,5 mm
 - Implementation of existing framework: 1,5 mm
 - or development of framework from ground up: 3,5 mm
- Establishing interfaces (except user dialogues): 2 mm

	Time (mm)	Costs (1 000 NOK)
Estimated time and cost for WP 2	4-6	450-750

WP 3: Implementation of core services (see also Figure 14)

This work package contains the arrangement of products in the inventory, the ordering of the products according to a schedule and presenting the products on the map, preferably as a route with named stops. It constitutes services like **the planner**, **the guidebook** and **the diary** as well as the **virtual concierge** and analytical services developed for the DMOs.

Tasks:

- evaluation of existing frameworks and tools: 0,5 mm
- building the main inventory (database): 1 mm
- implementing product imports through different interfaces: 1 mm

developing the planner, guidebook, and diary (see

Table 17): 2,5 – 6,5 mm

- implementing the SOA based architecture for retrieving information through the RESTful interface: 1 mm
- develop user dialogues: 1 mm
- develop DMO dialogues: 1 mm

	Time (mm)	Costs (1 000 NOK)
Estimated time and cost for WP 3	8-12	1050-1650

WP 4: Testing and verification

The system needs to be tested both technically and with real users to ensure the quality and to ensure the usability of the service.

Tasks:

- system testing (core functionalities): 0,5 mm
- interfaces and data integration: 0,5 mm
- user testing, travellers, and other user related tests: 1 mm
- user testing, DMOs, and other DMO based tests: 1 mm

	Time (mm)	Costs (1 000 NOK)
Estimated time and cost for WP 4	4	450

WP 2 – 4 will be carried out in an iterative way where input from especially WP4 user tests will lead to changes in WP 2 and 3.

All together we estimate a need for **20 to 26 mm, equalling 3,0 to 3,9 mill NOK**. These are rough Figures at this stage indicating the resources needed. The costs cover both in-kind and direct expences. Detailed requirement specification together with estimates from consultants is needed to get more accurate Figures.

7.2 Financing the project

We suggest a three party financing of the main project:

- Innovasjon Norge

- RFF Vestlandet
- Research Council (BIA project)
- Fjord Norway/NCET/DMOs (possibly also by using Skattefunn)

The first version of a Travel Notebook as outlined above, developed with common technology, could be financed by Innovasjon Norge (IN) and FjordNorway/NCET. The project represents a brave new take on the challenges of better digital marketing and as such should be suitable for funding by IN and also justify a funding by Skattefunn.

A development of the Travel Notebook must also take into consideration the running costs of maintenance and further development. There will be yearly costs operating the service.

The most ambitious and future looking part of the project, the Internet of Things approach, should be suitable for an RFF project and is explained in the next chapter.

Summary of the research and development plan

We have identified two development tracks for the realizing of a Travel Notebook:

1. A development plan based on today's technology
2. A research plan based on state of the art using the Internet of Things/Linked Data paradigm

The two tracks should be connected but in a way that the research part comes in at a later stage to evolve the first version of a Travel Notebook. The research plan is laid out in the next chapter.

To reduce risk and costs we propose a staged development plan where the architectural foundations are developed first with a simple "wish list" functionality as a first service to the travellers. The wish list can be gradually refined and more advanced functionality (route planning etc.) introduced. Also the DMO services should be developed introducing the simplest services first.

We propose these workpackages to realize the Travel Notebook:

- WP 0 – Project management
- WP 1 – Detailed requirement specification
- WP 2 – Base architecture and interfaces
- WP 3 – Core services
- WP 4 – Testing and verification

WP 2 – 4 will be carried out in an iterative way.

We have estimated the total costs to 3,0 – 3,9 mill. NOK depending on stages developed. This includes both direct expenses and in-kind contribution.

Relevant funding bodies and schemes outside own contribution (Fjord Norway/NCET/DMOs) Innovation Norway and the Norwegian Research Council (Skattefunn, BIA and possibly RFF).

8. Research plan for Internet of Things

We suggest a development plan in two parallel tracks. The first track is described in chapter 7, the other is the research track that will lay the foundation for a Travel Notebook based on the Internet of Things (IoT)/Linked Data (LD) principles.

This part of the development requires close collaboration with tellUs as the main information provider. It requires a transformation of tellUs' database to an IoT-based information repository. The transformation and restructuring of the tellUs database into IoT and an interface based on the Linked Data principles has been outlined in a previous research proposal from 2012. The proposal called *Linked Open Tourism*, written for the Norwegian Research Council's BIA call, was postponed.

Given the fact that the Travel Notebook was already a part of the *Linked Open Tourism* proposal, the current proposal would only need small changes to adapt to new situation. However, an IoT project like this will need close cooperation between the main actors in the tourism sector, with tellUs in the middle. A natural project consortium would be tellUs plus FjordNorge/NCE Tourism and VisitNorway.

These are the workpackages in the proposal from February 2012:

WP 1: Evaluation and modelling for an open world

WP 2: Design and implementation of the tellUs LOD (*Linked Open Data*)

WP 3: Open service innovation

WP 4: Open innovation business models

WP 5: Demonstrators: Tour Planner (e.g. the Travel Notebook) and apps

This project idea needs to be modified in a way that it supports the Travel Notebook needs, and other services' needs. At the same time the transformation of tellUs' database into an Internet of Things repository must be at the core of the project. The weight on new innovative business models for tellUs can be downplayed.

Appendix 3 gives a detailed description of the Internet of Things/Linked Data paradigm and modelling methodology.

9. Summary

Our user survey shows that travellers want the functionality described by a Travel Notebook (TN). Our survey of existing tools also shows that despite the amount of travel related services and apps, no single tool on the market covers the planned functionality of the Travel Notebook. **Our conclusion is therefore that the Travel Notebook should be developed.** It has the potential to both benefit the travellers and give the destination marketing organizations (DMOs) a unique possibility to get in contact with the travellers at an early stage. We also believe the **virtual concierge** can be a very valuable service in that respect. The service could be a real game changer for the local and regional tourism industry, and important even on a national level.

After analysing the user needs and the available services on the market we end up with two alternatives for realizing the Travel Notebook:

1. To collaborate with the makers of one of the tools in order to reduce risks, reduce resource needs, and to get a more market oriented product. From a technical and organisational point of view, the Norwegian web based travel planner app *Stay.com* seems to be the best candidate
2. To develop the Travel Notebook from ground up but with as much reuse of components and information as possible. We suggest a **stage based approach** realizing the easiest parts first and with the possibility to change the development plans underway

In this report we have concentrated on describing alternative 2. The project owner must consider if an alternative based on an existing service is worth pursuing.

We advice the development of a Travel Notebook to follow these guidelines in order to **reduce the risks** as much as possible:

- The Travel Notebook must be built on a robust and open service-oriented framework
- Choose a stage based development and carefully consider alternatives at each crossroad
- The development should at first concentrate on the planner part of the service
- User feedback suggest that the guidebook and especially the diary part are of less importance and should hence be delayed
- Reuse of information is the key to lower the risk – one should always look for services that already have a solution to the problem and try to reuse these by integration

From a **technological point** we advice the Travel Notebook be built using the following principles:

- The Travel Notebook must be based on a service-oriented architecture (SOA)
- The dialogue with the TN should be REST based web services
- There are multiple interfaces to the TN (traveller, DMO, CRM, CMS, external services)
- There must be different levels of integration to the TN (from deep to shallow)
- The TN must meet all the needs of the traveller and cannot be restricted to (Fjord)Norway

We further suggest a development with two parallel tracks; one for developing the Travel Notebook based on today's prevailing technology, and one research project that further enhance the Travel Notebook using the Internet of Things and Linked Open Data principles. Our estimate for realizing the Travel Notebook is in the range of **3,0 – 3,9 mill. NOK**, not including the research part (Internet of Things/Linked Data). Also yearly costs running the service must be taken into consideration. These are not estimated in this project.

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Appendix 1: User Survey (English version)

Travel Notebook tourism survey - SM

Survey of tourism planning and booking preferences

Dear traveller,

Visit Norway together with Fjord Norway, the marketing company for the fjords of Western Norway, is conducting a survey to learn more about planning and booking preferences among tourists.

We hope that you will take the time to answer the questionnaire, the 20 questions shouldn't take more than 5 minutes to complete. Your feedback is very important to us in our work to constantly improve the digital dialog with our guests.

We do not collect any personal or traceable information about you, your answers will be completely anonymous.

Click 'Next' to start the survey.

Background information

Background information about the traveller

*** 1. Country of origin**

☐ Norway

☐ Sweden

☐ Denmark

☐ Germany

☐ Netherlands

☐ Great Britain

☐ France

☐ Italy

☐ Spain

☐ USA

Other:

*** 2. What is your age?**

☐ < 20 years

☐ 20 - 30 years

☐ 31 - 45 years

☐ 46 - 60 years

☐ > 60 years

Travel Notebook tourism survey – SM

*3. Gender?

- ☐ Male
- ☐ Female

Travel planning

Travel planning, including "inspiration" phase

*4. To what country did you travel on your last vacation (a stay of at least a week)?

*5. How many months before travelling did you start planning your last vacation?

No. of months

*6. What resources did you use in your planning?

- ☐ General tourism websites (i.e. Tudors, Michelin, Lonely Planet)
- ☐ Destination websites (visitnorway.com, fjordnorway.com, visitdenmark.com)
- ☐ Social media (Facebook, Twitter, TripAdvisor ++)
- ☐ Brochures
- ☐ Travel books
- ☐ Travel agency
- ☐ Family and friends
- ☐ Other

Please specify

*7. What part of the vacation did you plan?

- ☐ Route within the destination
- ☐ Attractions and activities
- ☐ Other

Please specify

Travel Notebook tourism survey – SM

*8. How do you keep information (el. tickets, reservations, travel information) about your trip?

- ☐ Bookmarks in the web browser
- ☐ E-mail
- ☐ Downloaded travel information (and eventually print-outs)
- ☐ Electronic notebooks (OneNote, Evernote etc.)
- ☐ Tailored applications (such as TripIt)
- ☐ Other

Please specify

What booking

*9. What did you book in advance?

- ☐ A package tour (the whole trip)
- ☐ Accommodation
- ☐ Travel within the destination (flight, boat, car rental etc.)
- ☐ Attractions and activities
- ☐ Other

Please specify

Booking accommodation

*10. How did you book your accommodation?

- ☐ International booking services (hotels.com, booking.com, tripadvisor.com etc.)
- ☐ National booking services (specific for the country/region)
- ☐ Directly through the hotel's own booking system or email (or cabin, camping etc.)
- ☐ Other

Please specify

Why general booking system?

Travel Notebook tourism survey – SM

* 11. Why did you use a general booking service (like booking.com, hotels.com etc.)?

- ☐ Price comparison
- ☐ User ratings
- ☐ Good overview, easy to locate
- ☐ Good experience from previous use
- ☐ No other options available
- ☐ Other

Please specify

Booking experience

12. How was your booking experience?

	Poor	Below average	Good	Very good	N/A
Global booking services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Travel agencies and tour operators	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local and national booking services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Direct booking (through the hotel etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Comments

13. Rate the importance of the following criteria when booking an accommodation

	Not important	Less important	Important	Very important
Price	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Quality (in terms of stars)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
User ratings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Location	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Facilities (free internet access, swimming pool etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Comments

During the trip

Travel Notebook tourism survey – SM

* 14. Did you follow your original travel plan?

- ☐ Yes
- ☐ Yes, mostly
- ☐ No, a lot of changes during the trip

Comments

* 15. Did you use any electronic devices on your trip?

- ☐ Yes
- ☐ No

Use of electronic devices

* 16. What type of electronic device(s) did you use on your trip?

- ☐ Smartphone
- ☐ Tablet (iPad etc.)
- ☐ PC
- ☐ Other

Please specify

* 17. What did you use your device for?

- ☐ General information (news, email etc.)
- ☐ Complementing travel information
- ☐ Additional bookings
- ☐ Find attractions nearby
- ☐ Find out "what's on"
- ☐ Share travel information with family and friends
- ☐ Work
- ☐ Other

Please specify

Sharing information

Travel Notebook tourism survey – SM

18. Did you share your experience from the trip with others?

- ☐ Personally to family or friends
- ☐ Through social media (TripAdvisor, Twitter, Facebook etc.)

Additional comments

19. Have family or friends travelled to places you have been because of your recommendation?

- ☐ Yes
- ☐ No (not yet)
- ☐ I don't know

Comments

Digital travel planner

20. What features should a digital travel planner include?

- ☐ Tickets and booking confirmations (all in one place)
- ☐ My personal list of attractions, activities and events I want to visit (also for off-line access)
- ☐ Route plan (car, public transport)
- ☐ Show nearby attractions and activities
- ☐ Diary (possibility to add text and photos/videos from the trip)
- ☐ Other

Please specify

Final page

Thank you for your contribution!

The result of this questionnaire will be used to plan a Travel Notebook which will provide tourists coming to Norway with a better tool for organising their trip.

If you click on 'Done' you will be taken to the homepage of Fjord Norway, or you can choose to go another place.

Appendix 2: Travel planning sites and apps

- [Reiseplanleggeren](#) (for VisitDenmark)
A simple travel planner aimed at the Norwegian market. A unique feature of this planner is that it covers the whole of Denmark. On the other side it is very simple and it requires a Facebook account to log in.
reiseplanleggeren.visitdenmark.no
- [MyTravelGuide.com](#)
Provides destination guides, online travel planning, and flight-booking. Read user reviews before you book.
www.mytravelguide.com
- [I Go U Go](#)
Community of enthusiastic globetrotters offering personal advice, journals, photos, and anecdotes from their trips. Find what travelers have to say about destinations around the world, get in touch with other travelers, and see their photos to inspire your own journey.
www.igougo.com
- [TravBuddy](#)
Travelogue sharing site featuring personal journal entries, travel reviews, photos, and online community resources. Also includes user tips and travel experiences from around the world.
www.travbuddy.com
- [Gusto Travel Guide](#)
Travel planning tool with hotel and travel reviews, online reservations, travel photos, blogs, and destination information.
www.gusto.com
- [Earth Travel Reviews](#)
Selection of travel reviews for vacation destinations worldwide. Read what critics say about hotels, inns, resorts, spas, tours, and attractions.
www.etravelreviews.com
- [Vinivi](#)
Find hotel reviews, photos, and videos from travelers around the world.
www.vinivi.com
- [GeckoGo](#)
Community driven travel site features reviews, tips, guide info, and other information on places to go and what to see.
www.geckogo.com
- [World Reviewer](#)
Collection of travel experiences on earth, from adventure travel to cultural wonders, reviewed by experts and users worldwide. Includes images and holiday ideas.
www.worldreviewer.com
- [Liquidtravel](#)
Features articles, photos, links, and forums about traveling abroad.
www.liquidtravel.org
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Gogobot offer trip planning tools, allowing users to connect with friends to get trusted advice and download it to their mobile device.

www.gogobot.com

- [Open Travel](#)
Share your travel experience and plan your trips with these travel guides and hotel reviews. Also features photo sharing, travel blogs, and travel forums.
www.opentravel.com
- [Tour and Travel](#)
Travel guide with tips and reviews of hotels and resorts, as well as places to visit.
www.tourandtravel.com
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Provides facts about hotels and particular rooms so you can make an educated decision when choosing your room.
www.tripkick.com
- [Travel Tamed](#)
Travel blog that covers tips and guides on traveling around the world and provides in depth information about popular travel spots.
traveltamed.com
- [VirtualTourist](#)
VirtualTourist is a worldwide travel community where real travelers and locals share real travel advice and experiences.
www.virtualtourist.com
- [TravelMuse](#)
TravelMuse offers relevant recommendations and provide tools to organize all research in one place by saving information from **any** Web site.
www.travelmuse.com/

167 APIs related to travel sites

<http://www.programmableweb.com/apis/directory/1?apicat=Travel>

526 mashups related til reise sites <http://www.programmableweb.com/tag/travel>

9 examples of codes related to travel sites

<http://www.programmableweb.com/tag/travel?other=1>

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Get to know people you're going on holiday with before you get there.

Travel apps and offline maps

iOS:

- Tripomatic
- Gogobot
- Viator
- City guides, Offline Maps (= Stay.com's app)
- Triplt
- Lonely Planet Travel Guides
- UNESCO World Heritage – location guide
- TripJournal
- Wikitude (augmented reality)
- Where To
- Packing Pro
- SpringPad

Offline maps (iOS):

- TripAdvisor Offline City Maps
- OffMaps²
- City Maps 2Go
- Galileo Offline Maps
- Pocket Earth Offline Maps
- MapsWithMe Lite/Pro
- Apple's own iOS Maps prove offline functionality

Android:

- Where
- Trip Journal
- Triplt
- TouristEye
- TripJournal
- Wikitude (augmented reality)
- SpringPad

Offline maps (Android):

- Google Maps offers two possibilities for viewing maps offline:
 - 'Make available offline', menu choice to save map offline
 - 'New offline map', type a place (city, region) and save (max 6 maps)
- MapsWithMe Lite/Pro
- City Guides, Offline maps (Stay.com)
- Sygic GPS Navigation
- MapDroyd – offline maps
- Maverick Lite/Pro GPS Navigation

Appendix 3: The Internet of Things/Linked Data Modelling Methodology

In the following the IoT/LD modelling methodology applied to the construction of the back-end system (information representation) for a web site is outlined in a logical modelling language that span three levels of abstraction, the object language and metalanguage levels. The modelling methodology is based on the Kantian distinction between being and appearance, a thing and its properties, and it is complying with the design principle 'separation of concerns' (SoC). This principle is in particular applied to separate the domain of the information representation into the object domain, i.e. 'things in the world', which for tourism are the attractions, activities and services like accommodations, transport etc., and the domain of 'information elements'²⁷ about them and their constituents. The separation imposes the distinction between knowledge representation and information representation.

Semantic technology and relational database implementations are sketched in the concluding section.

Knowledge Representations

A knowledge representation is a structured organisation of the knowledge about the individuals of a domain, the structure being provided by a domain model and ontology, and the knowledge by a set of sentences implicitly assumed to be true, its knowledge base. The task of modelling a knowledge representation thus consists of specifying four separate components:

- domain model
- name listing
- knowledge base
- ontology

Domain model (knowledge representation)

The domain D of individuals and relations (attractions, activities etc.) is modelled by a directed graph:

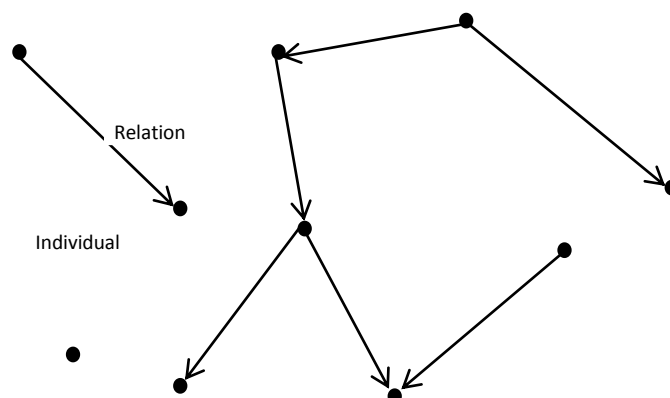


Figure 18: Domain model

²⁷ In this context an information element is the collection of constituents that makes it possible to produce a web page.

The symbols denoting the elements of the graph belong to the metalanguage. The model of the domain therefore consists of a set of metalanguage 'sentences' of the form $R_i(d_1, d_2)$ where R_i is standing for kind of relations.

Name list

The name list consists of the metalanguage sentences relating a thing d to its name n , i.e. the sentences of the kind $\text{NameOf}(n, d)$. Together with the sentences of the knowledge base it provides the language with a formal semantic of the primary vocabulary by the following construction: the extension $\text{Ext}(p)$ of p is given by $\text{Ext}(p) = \{d \mid pn \ \& \ \text{NameOf}(n, d)\}$ ²⁸ where ' pn ' reads ' n is p '.

The semantics of the secondary vocabulary is obtained from that of the primary vocabulary through the definitions of the ontology.

Knowledge Base

The knowledge base is constituted by a set of fact sheets, one for each individual. They are all based on the same template for each kind of individuals, i.e. the same set of sentences but with different 'values'. A fact sheet lists all true atomic object language sentences about an individual, i.e. the sentences attaching properties and attributes to the individual. The fact boxes in Wikipedia are examples of fact sheets.

Ontology

The *ontology* for a language is a non-logical vocabulary supplemented by a set of

- axioms
- intensional definitions
- extensional definitions

examples of which are the menu definitions of web sites that are extensional definitions which together with the basic vocabulary constitute ontologies.

An axiom is an implicit definition that relates some of the *primary words* (terms and primary one-place and two-place predicates²⁹) of the vocabulary of the object language. The axioms picture structural properties of the domain and express restrictions on the possible meaning of predicates. The intensional and extensional definitions are terminological. They define secondary predicates that serve to facilitate the discourse in terms of primary predicates, e.g. instead of having to repeat the properties that an individual must possess to be of a certain kind an intensional definition will introduce a predicate to denote the kind. An intensional definition of a predicate (definiendum) is thus the conjunction of atomic sentences (definientia) stating which properties an individual must possess for the predicate to apply. When the meaning of the definientia is given the definition explains the meaning of definiendum. An extensional definition of a predicate on the other hand, is simply disjunction of sentences, juxtapositions of the predicate and the names of the individuals that

²⁸ $\text{Ext}(p)$ is the set of individuals that possess the property p .

²⁹ Ideally, these are predicates standing for properties/attributes and kinds of relations.

constitute its extension. When the individuals referred to are known, the extension of the predicate is determined. From an intensional definition of a predicate an extensional one can be derived; the extension of the predicate is the class of individuals that satisfies definientia in the intensional definition. It follows that the interpretation of the vocabulary is determined by the interpretation of the primary vocabulary.

An ontology does not determine the meaning of words. It does however contain (semantic) information that limits the scope of possible interpretations of the primary vocabulary. Its construction therefore has to be done in an interpreted language and evaluated accordingly, i.e. justified by pragmatic and semantic considerations.

The axioms capture structural elements of the domain.

Information representations

An information representation is a knowledge representation supplemented with web pages (containing, texts, photos, videos etc.) about the individuals, the *information base*. The only amendment of the knowledge representation is an extension of the domain model to include the web pages that can be thought of as ‘individuals’ of a different kind.

Domain model (information representation)

The extended domain \bar{D} of D also contains web pages about the individuals. An example is pictured by the directed graph (Figure 14):

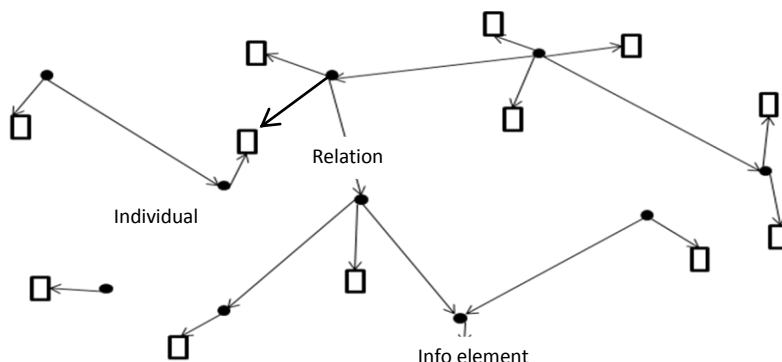


Figure 19: Domain model of information representation

The domain model of the information representation extends that of the knowledge base by including the metalanguage sentences $D_B(d, \bar{d})$, ‘ d is described by \bar{d} ’.

The information needed to produce a web page, i.e. template, style sheet etc. is represented in files that are ‘things’ and thus belong to the (extended) domain. These objects have no relations to the things of the object domain but the particular relation ‘BelongTo’ to the information elements. Moreover, the functions like selectors (‘+Add to Guide’ in stay.com) are realised by programs that also are ‘things’ belonging to the domain and thus represented by an URI though it may access information from other sources through APIs, e.g. Google maps, yr.no etc.

A web page is thus conceived as a collection of objects linked to its identifier (URI) as illustrated by Figure 15,

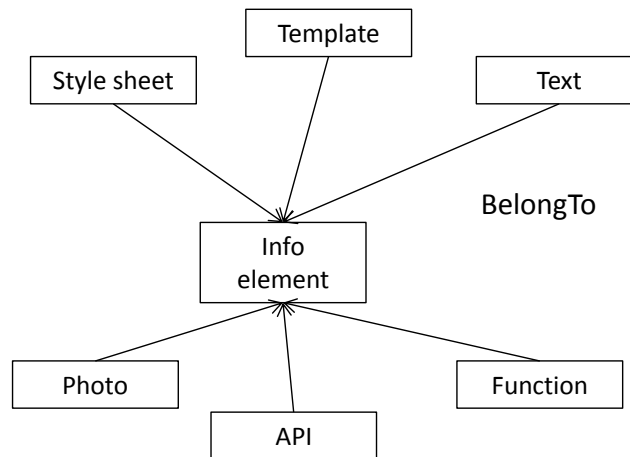


Figure 20: A web page as a collection of objects

Querying

The structure and information content of a web site determines the mode of querying an information system and its results³⁰.

Knowledge base

Querying in a knowledge base means to ask for the extension of a predicate. In fact, an atomic query is just a question $px?$ where p is a primary one-place predicate, i.e. standing for a property (what are the things that possesses the property p ?). The answer to this question is the set $\{d \mid px \text{ \& NameOf}(x,d)\}$ of individuals. If p is a secondary predicate extensionally defined, then the ontology transform the query into a disjunction of atomic queries and the result is the union of the result sets of the individual queries; if the predicate is intensionally defined the query is transformed to a conjunction of atomic queries and the result is the intersection of the result sets of the atomic queries.

The result of a query with respect to a two-place primary predicates gives the extension of the predicate. However, if a particular relation is not represented in the domain model it might be revealed by querying through the ontology. Thus let, for example, 'if $\forall_{xyz} r_1xy \text{ \& } r_2xz \text{ then } r_3zy$ ' be an axiom, then

$$r_1xy? = \text{Ext}(r_1) = \{(d_1, d_2) \mid (\text{if } \forall_{xyz} r_1xy \text{ \& } r_2xz \text{ then } r_3zy) \text{ \& } \bar{r}_1\text{Of}(d_1, d_3) \text{ \& } \bar{r}_3\text{Of}(d_2, d_3)\}$$

The set of individuals determined by a query is the (semantic) meaning of the query word. By means of queries we can thus establish the semantics of the description language. The extensions of the primary vocabulary constitute a conceptual model of the domain.

Information representation

A query in an information representation is a two-step procedure. It determines the individuals whose fact sheet satisfy the search word and then use the domain model to pick the web pages about the individuals, i.e. $\{\bar{d} \mid px \text{ \& NameOf}(x,d) \text{ \& } D_B(d,\bar{d})\}$. The knowledge base thus serves as an index for the information representation and the data on the individuals listed in their fact sheets play the role of metadata determining the retrieval of web pages.

³⁰ This applies to database querying etc. not free-text querying.

The Implementation of an Information System

There are several possible representation methods for information representations, the one closest to the modelling above being semantic technology systems based on the “Internet of Things/Linked Data” (IoT/LD) modelling paradigm. The IoT/LD systems can be distributed, e.g. the information repository can be part of the linked open data (LOD) cloud. Other kinds of implementations to be considered are relational database management systems (RDBMS) and hybrid solutions, i.e. solutions for which the information bases are contained in one or several relational databases while the knowledge representations are IoT/LD systems centrally managed.

IoT/LD systems have the advantage of being able to represent more general ontologies than relational databases which can represent only extensional definitions, though intensional definitions can be used to define queries.

The implementations distinguish between data repository and query language.

Internet of Things/Linked Data

The “IoT/LD” paradigm exemplifies the Kantian distinction between a thing and its properties. It stands for the idea of referring to “things of the world” on the Web by Universal Resource Identifiers (URI) that function as IDs. The names, properties and relations moreover are represented by universal resource locators (URL). The components of a knowledge system can therefore be represented by RDF-graphs,

- the domain model is the set of RDF-triples relating individuals
- the name list is the set of RDF-triples giving names to individuals
- the knowledge base is the set of fact sheets each of which is constituted by the set of RDF-triples being the linguistic description of an individual
- the ontology is the set of RDF-triples and OWL sentences expressing the axioms and extensional and intensional definitions

Ideally Linked Data refers to the linking of the fact sheets via the domain model. Presently, the existing cloud of linked open data (LOD) on the web does not fully satisfy this ideal. Information elements from the cloud can still be reused for the construction of an information representation. It necessarily involves the definition (construction or selection) of the extended domain model which provides the basic structure of the information representation and the ontology that introduces a vocabulary. The name list and fact sheets can be extracted from the LOD if the corresponding information is available, otherwise established as part of the construction of the information system.

Relational database

Relation databases provide the support for the standard implementation of an information representation whose ontology only contains extensional definitions³¹. The components of the knowledge representation and information representation are represented by tables. There are several ways of doing this. For example, the domain model

³¹ Axioms and intensional definitions cannot be represented in a relational database.

Table 18

Rel ₁		Rel ₂			
id _{x1}	id _{y1}	id _{u1}	id _{v1}		
id _{x2}	id _{y2}	id _{u2}	id _{v2}		

the fact sheet of an individual can be represented by a row in (table under)

Table 19

Name	Property A	Property B	Property C	
n ₁	a ₁	b ₁	c ₁	
n ₂	a ₂	b ₂	c ₂	

the name list (table under)

Table 20

NameOf	
id ₁	n ₁
id ₂	n ₂

extensional definition (Definition of A), table under

Table 21

Name	Predicate
n ₁	a ₁
n ₂	a ₁

The export of information from a DBMS to a IoT/LD representation is done by a map that transforms the content of the tables into RDF-triples, e.g.

Table 4: (id_{x1}, Rel₁, id_{y1}) etc.

Table 5: (n₁, Type, a₁), (n₁, Type, b₁) etc.

Table 6: (id₁, NameOf, n₁) etc.

Table 7: (n₁, Type, a₁) and (n₁, Type, a₁) and etc.

Whether the structure of information representation can be obtained, i.e. the knowledge representation depends on the content of the database. If not, the knowledge representation must be completed 'by hand'.

Hybrid systems

In a hybrid implementation all or parts of the knowledge representation is introduced as a semantic layer through which one access the database. The most interesting case is the situation where the knowledge base forms a semantic layer on a collection of relational databases each of which contains web pages selected to constitute the information base. The knowledge base is however managed centrally independently of the structure of the databases.