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Alternatives of business model concepts for the RI Consumer Data Platform

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Summary

The current deliverable aims at presenting the business model alternatives that are generated within T12.1 of RICHFIELDS project. As the first task of WP12, T12.1 aims at generating business model alternatives to create the preliminary step of the final design of the mature business model of FNH RICHFIELDS RI. It should be noticed that the aim of this task, and thus this report, is not to describe and present the final detail business model design; but to design and present some alternatives that will be assessed in T12.2 from economic, scientific and societal perspectives to select the most suitable business model alternative and thereafter start the detail design of the selected alternative in T12.3.

The deliverable is structured in a way to first provide a general overview of WP12 and its objectives and the links between different tasks of the work package. Thereafter, the methodology that has been pursuit to generate business model alternatives will be presented to provide the reader with a clear picture of the framework used within T12.1. A state-of-the-art analysis will be introduced including the results of critical analysis of business models of existing RIs as well as considerations for an innovative RI business model. Thereafter we will present the three main generated business model archetypes and will go on with definition of business module and alternatives for the selected archetype. Finally we will close the deliverable with highlighting the link of the outcomes of this deliverable to other tasks in WP12 and other WPs of RICHFIELDS project.

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List of Abbreviations

BM: Business Model

CPG: Consumer Packaged Goods

CSR: Corporate Social Responsibility

EC: European Commission

ESFRI: European Strategy Forum on Research Infrastructures

EU: European Union

EUROFIR: European Food Information Resource Network

FNH: Food, Nutrition, and Health

GA: General Assembly

GDSN: Global Data Synchronisation Network

ICT: Information Communication Technology

NGO: Non- Governmental Organisation

RI: Research Infrastructure

RIMs: RICHFIELDS Inventory Management systems

SME: Small Medium Enterprise

UX: User Experience

WP: Working Package

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1 WP overview and objectives

The overall objective of the RICHFIELDS project is to design a world class research infrastructure on food and health consumer behaviour and lifestyle that will serve to collect, align and share data, as well as offering other services, in order to enable researchers, policymakers and other stakeholders such as industry and individual consumers to develop, evaluate and implement effective food and health strategies both at the level of individuals and population.

As a crucial part of design phase, WP 12 of RICHFIELDS aims at developing and designing a sustainable business model for FNH-RICHFIELDS RI that provides value to all the stakeholders involved in FNH-RICHFIELDS. The business model will define the services that will be provided to the different infrastructure's customers (any organization or individual who will use FNH-RICHFIELDS RI services in exchange of membership fee, service fee, data exchange, etc.), the supply chain configuration (i.e. the way services will be produced and provided to customers, the interaction with partners, and the required resources to provide services), and the financial mechanism to implement and run the RI in a an economically sustainable manner (i.e. the revenue model and cost structure).

The final outcome of WP12 will be a final design of FNH-RICHFIELDS RI business model for the maturity stage and a roadmap defining the steps about how to start implementation of business model from to get to the final business model at maturity stage. The current document defines the main business model alternatives that have been designed within T12.1 of WP12. The generated business model alternatives describe the general overview of business model considering different type of customers it could target. The output of this report is used by T12.2 to assess the business model alternatives from economic, scientific and societal perspectives and to highlight differences among business model alternatives. Thereafter, within T12.3, the best-fit business model alternative will be selected and designed in a detailed level. In section 2 of this report, the methodology and breakdown of WP12 and detailed definition of each task are presented.

2 Methodology

In order to design the RICHFIELDS business model, as the final outcome of WP12, we have split the activities into five main phases. Figure 1 provides and overview and illustrates the WP12 methodology and the five main phases.
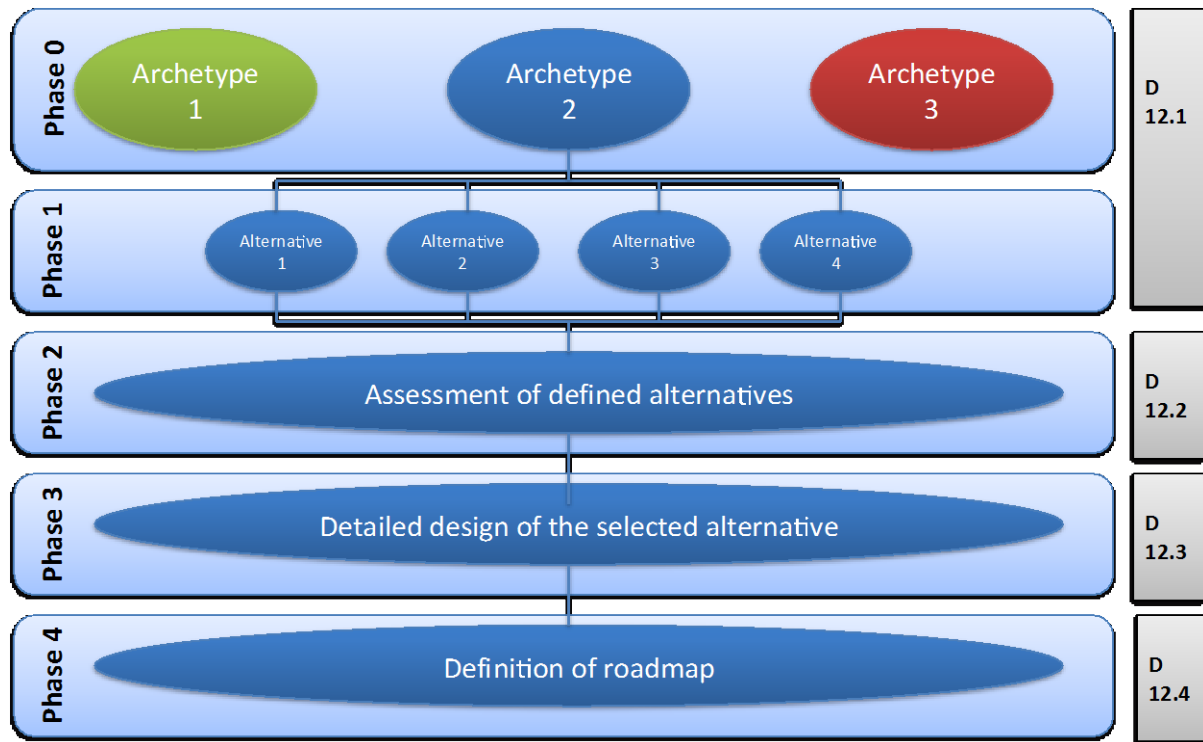
Figure 1. Methodology and breakdown of WP12

As shown in Figure 1, the five main phases of WP12 present a sequential structure to generate the two main outputs of WP12, namely the detailed business model design and the roadmap.

Phase 0 is considered as a preliminary phase to establish the required foundation for T12.1 to generate business model alternatives. During this preliminary phase, three main archetypes for the RICHFIELDS RI are defined. Based on an analysis of pros and cons of each archetype, one archetype is selected, the business model alternatives for that archetype will be generated. Section 7 of this report provides a detailed description of this phase and the generated archetypes.

Phase 1 deals with the definition of business model alternatives for the RICHFIELDS RI at a strategic and macro level (T12.1). Accordingly for each alternative, different building blocks of business model will be designed, presenting different characteristics and features of each alternative. The output of phase 1 will serve as the input of phase 2 and T12.2.

Phase 2 includes assessment and evaluation of the generated business model alternatives (T12.2). The defined business model alternatives within T12.1 will be assessed from economic, social and scientific perspectives at a macro level. The results of this macro-assessment highlight the differences between alternatives and will eventually provides the required background to select the best-fit alternative to go further with the detailed design.

Phase 3 is focused on detailed design of the business model for FNH-RICHFIELDS RI for the maturity stage (T12.3). To do so, the generated business model alternatives and their assessment will be discussed to choose the best alternative. Once the selection is done, the detail design of business model will take place.

Phase 4 is the final phase aiming at defining the road mapping for FNH-RICHFIELDS RI business model will be defined based on the final business model design. The roadmap will define the steps toward reaching the final mature business model starting from a first version implementation to more evolved versions and finally the mature business model.

3 Task12.1 methodology and link with other WPs

WP12 is a part of Phase 3 of the RICHFIELDS project. Accordingly, an effective pursuit of WP12 activities requires a strong and concrete link with other WPs of the RICHFIELDS in Phases 1 and 2. Figure 2 shows the methodology and sequence of activities carried out in T12.1 to generate the business model alternatives. The scheme also illustrates where and how the input from other WPs and discussions among consortium partners were linked to activities of T12.1.
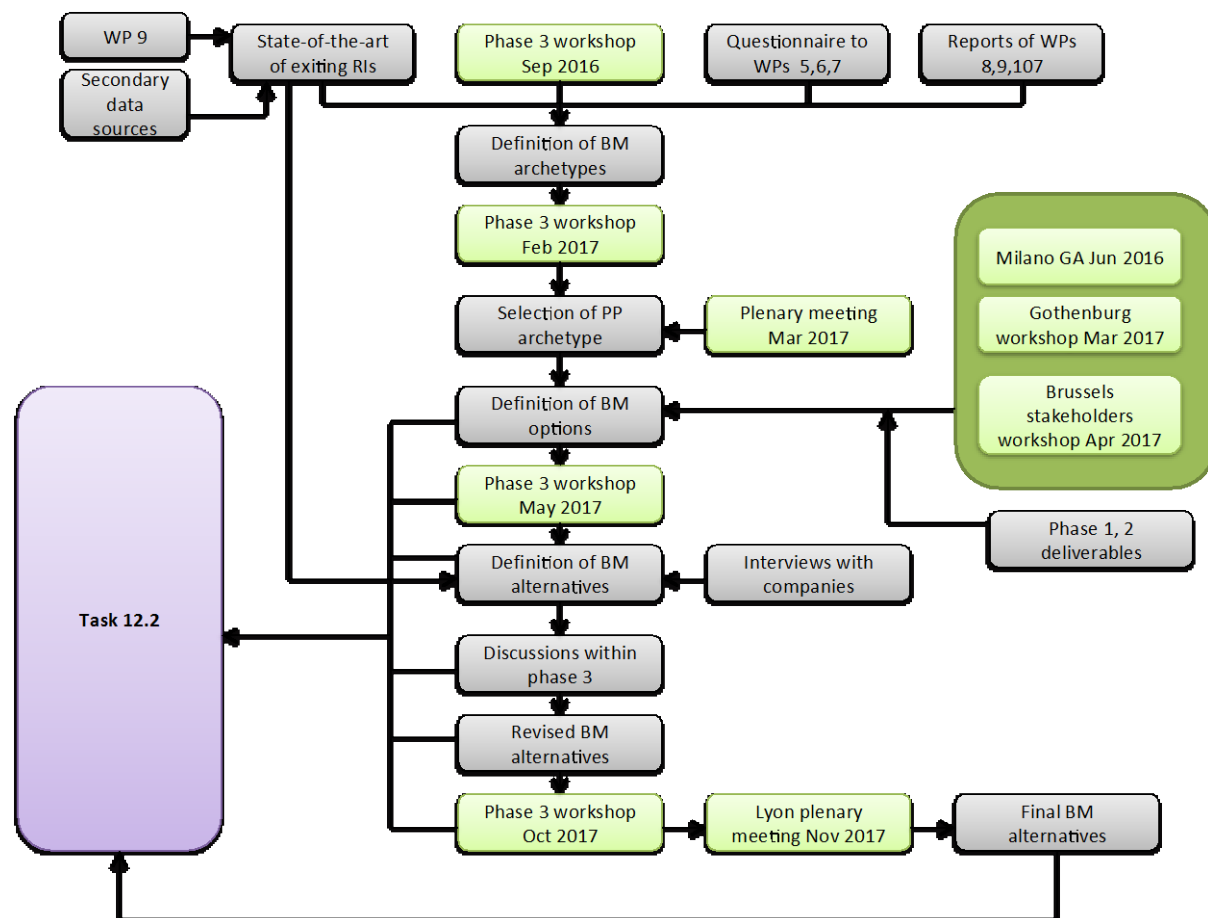
Figure 2. T12.1 methodology and sequence of activities

The required input to design the business model alternatives has been collected through four different sources: 1) Internal WP12, phase 3 and project consortium discussions 2) analysis of business models of existing RIs 3) Input from Phases 1 and 2 of the RICHFIELDS and 4) Interview with companies.

Green boxes in figure 2 represent the events through which input are collected to design the business model alternatives (Source 1). In particular these events were:

- Milan General Assembly on 28-29 June 2016, where discussions about business model options were held among consortium partners in a specific breakout session;
- Phase 3 workshop on 27-28 September 2016 in The Hague, where initial ideas about business model archetypes were presented and discussed further among phase 3 partners;
- Phase 3 workshop on 14-15 February 2017 in Guildford, where the defined business model archetypes were presented and discussed as well as the links with other WPs;
- Gothenburg plenary meeting on 7-8 March 2017 where the revised business model archetypes were presented and discussed with consortium partners;
- Gothenburg break out session on 8 March 2017, where in-deep discussions were held about options of business model building blocks such as value propositions, key partners, revenues, etc.;
- Second stakeholder workshop on 4 April 2017 in Brussels, where needs, requirements and expected service offerings of RICHFIELDS RI were discussed with external stakeholders;
- Phase 3 workshop on 3-4 May 2017 in The Hague, where defined options of business model were presented and discussed and the concept of BM modules and alternatives were presented and discussed;
- Phase 3 workshop on 2-3 October 2017 in The Hague, where the revised version of defined business model modules and alternatives were presented and discussed among Phase 3 partners as the final check-point to generate the final version of BM alternatives;
- Lyon General assembly meeting on 6-7-8 November 2017, where a general picture of the business model alternative were presented through phase 3 presentation and further discussions about business model took place within the breakout session;
- Telco with project management on 30 November 2017 about the design of business model alternatives and to receive her insights to finalise the task.

Meanwhile, several tele-conferences and un-official meetings were held between WP12 and other WPs (especially those in Phase 3).

SOURCE 2 refers to desk research and took a closer look to existing research infrastructures as listed in Table3.

SOURCE 3s' input is mainly given by deliverables resulting from Phase 1 and 2 of the RICHFIELDS project (mainly Work packages 5-10) [1], [2], [3], [4], [5], [6]. The questionnaire sent to WPs 5,6 and 7 including the received answers are presented in Appendix of this report.

Source 4 includes two interviews which were conducted with two business stakeholders in order to collect required input from a business perspective and fine-tune the defined business model modules.

The first interview was done with **GS1 Slovenia** about their Global Data Synchronisation Network (GDSN) to understand how their business model looks like, whether and how it would be possible to include them as partner in RICHFIELDS, what would be the type of business relation to establish with them, what would they expect from RICHFIELDS in case of providing data, etc.

The second interview was done with **FoodProfiler** a Wageningen university-based food mobile application. The interview aimed at understanding the business model of FoodProfiler, the conditions

to establish partnership with the app as a data provider for RICHFIELDS RI, potential value propositions that RICHFIELDS could provide to them, etc.

3 State-of-the-art of existing RI business models

In order to understand the state-of-the-art of existing RIs, a critical analysis was done on a set of research infrastructures that aim at collecting and providing food and health data. In order to do identify the relevant RIs and analyse their business models two main sources were used: 1) Report of T9.1 named "Integrated report on four case studies and proposed data outputs for RI consumer data platform" and 2) the secondary data sources about each mentioned RI including their websites, newsletters, relevant reports, deliverables, etc. [5], [8], [9], [10], [11], [12], [13].

In order to have a clear and concrete understanding of the state-of-the-art of existing RI business models, the features and characteristics of each RI were mapped considering several dimensions of a business model namely, value proposition, key resources, key suppliers, key activities, customer segment, revenue, cost structure and governance. In addition, we have also mapped the RIs regarding their access policy. Figure 3 shows mapping of the business model of these RIs. White cells refer to dimensions for which information were not available.

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	Buisness model building blocks								
	Governance	Key resources	Key Suppliers (Data providers)	Key activities	Value proposition	Customer segment	Access policy	Revenue	Cost
National data sets	Public	Experts in food composition	Analytical data from surevys specifically for data set, literature, claculations, manufacturers' data, other national data sets	Data collection, data integration, platform running	High quality data for generic foods . High quality data for branded products	National dietry monitoring surveys, public (?)	Mostly free but some are subject to license agreement		
EUROFIR	Public	IT infrastructure, experts	Other RIs, data suppliers	Data collection, data integration, data harmonisation, platform running, customer relationship management	Food composition data, experties to use and manage data in research and industry	Researchers, industry	Access for members	Project funds, membership fee	Maintenance cost, Personnel cost, update cost, operation cost
FoodEXplorer(EuroFIR)	Public	IT infrastructure, experts	Literature, National dat sets and other networks and infrastructures	Data collection, data integration, data harmonisation, platform running, customer relationship management	High quality data, integration of national data sets	Researchers, industry, mainly Dieticians	Access for members	Project funds, membership fee	
FoodBasket (EuroFIR)	Public	IT infrastructure, experts	Litearture, National dat sets and other networks and infrastructures	Data collection, data integration, data harmonisation, platform running, customer relationship management	High quality data of composite and prepared food, accessible via different channels (app, website), integration of national data sets,Data set in xml or word format	Researchers, industry, mainly Dieticians	Access for members	Project funds, membership fee	
eBASIS (EuroFIR)	Public	Evaluators, IT platform	Scientific publications	Data collection, data integration, data harmonisation, platform running, customer relationship management	High quality data for :Bioactives and bioactive peptides in meat, bioeffects of bioactives,extensive search options, access and wexport data,data reports	EUROFIR members (Researchers, industry, etc)	Only EuroFIR members, occasionally temporary access to non-member researchers	Project funds, membership fees	Maintenance cost, Personnel cost, update cost, operation cost
BBMRI-ERIC	Public	IT infrastructure, experts		Data collection, data integration, data harmonisation, platform running, customer relationship managemen	Annual conference, directory, data locator, data negotiator, standardisation, expert center, tools, ELSI helpdesk	Researchers, industry, policy makers		Public funds	Maintenance cost, Personnel cost, update cost, operation cost
Phenol-Explorer	Public-private	Evaluators, IT platform	Scientific publications	Data collection, data integration, platform running	Data about polyphenols in food and beverages	Researchers, industry	Free and unrestcited access	the French government, the Institut National du Cancer (France), and industry partners (Unilever, Danone and Nestlé)	Maintenance cost, Personnel cost, update cost, operation cost
USDA	Public	Evaluators, IT platform	Litearture	Data collection, data integration, platform running	data or flavonoids, isoflavones and proanthocyanidins		Free access	Governmental funds	Maintenance cost, Personnel cost, update cost, operation cost
Brandbank	Private (Owned by Nielsen)	apps		Data collection, data integration, platform running	Data access	retailers	Fee for commercial use	Pay per servcie	Maintenance cost, Personnel cost, update cost, operation cost
QUISPER		IT infrastructure, experts		Data collection, data integration, platform running	Scientificaly validated integrated data of food and health, knowledge rules and blood & DNA	Researchers, industry, app developers			
GloboDiet	Public	IT infrastructure, experts	70 common or country-specifica databases, projects data,	Data collection, data integration, platform running	Standardised dietary data on consumption, Globodiet-24HDR programme, GloboDiet-Data entry system, GloboDiet recipe manager and recompute programme, e-training platform	Researchers	Conditional access	Open access	
PRECIOUS	Public	PRECIOUS App, IT infrastructure, experts	Consumers	Data collection, data integration, app running, consumer relationship management, data analysis	Behaviour-based recommendations, Physical activity tracke, reports	Consumers	Open app	Government funds	Maintenance cost, Personnel cost, update cost, operation cost

Figure 3. Mapping of existing RIs business models

A critical analysis of the selected RIs highlight the following points about their business models:

- The major part of the investigated RIs target researchers as their main customers and services to researchers. There are very few RIs that offer limited services to business entities and any of them includes consumers and citizens as both data providers and customers.
- Most of the mapped RIs are **public RIs**. Out of the two outliers, one is private and the other is public-private. This strong focus on public funding could be due to the fact that most of these RIs are outcomes of European funded research project. Moreover this also highlights the challenges and difficulties in attracting private funds to establish these RIs. However, it can be seen as an opportunity for the creation of public-private RIs that offering sufficient value to attract private funding.
- Nearly all of the RIs offer **access to high quality data** as their main value propositions. While only some of them have other value propositions such as data analysis and data expertise.
- **Researchers and industry** are the main customer segments served by these RIs.
- Regarding the key resources, most of the RIs consider **IT infrastructure and expert** human resources as the critical key resources.
- Approximately all of the mapped RIs consider **secondary data sources** such as literature, publications and national data sets as the main sources of data provision. In this regard EUROFIR differs as they aim at establishing connection with the other RIs and integrate their data into EUROFIR platform. Meanwhile the PRECIOUS platform is another example that directly collects data from consumers through its app.
- Data collection, data integration and platform running are common key activities for all the RIs.
- In terms of access policy, the mapped RIs are quite diverse. While some of them allow free access to customers (i.e. Phenol-Explorer) others only permit registered members to access the RI (i.e. EUROFIR).
- Aligned with their public governance, the main revenue streams of most RIs are **public funds** from governments or EU projects. Meanwhile in order to ensure long-term sustainability, some of them such as EUROFIR have introduced membership fee as an additional revenue source.
- The main costs of the RIs relate to operation and maintenance cost, as well as personnel cost.

Considering the outcomes of the state-of-the-art analysis of existing RIs the following insights can be derived:

- There is a need to engage business and consumers to RIs to facilitate data provision both from business entities and from individual customers.
- A public-private RI would be an innovative type of business model for RIs because of its potential for long-term sustainability. While this funding model may present challenges at the beginning in attracting private funds for the establishment of the RI, it is the future of RIs to sustain themselves over the long term.

- Currently, very few RIs collect consumer data directly from citizens since they are mainly dependent on secondary-source data from literature. An innovative business model could involve consumers in the RI and engage/encourage them to provide their food and health data directly to RI, for instance through an app.
- Within the business models of existing RIs, there is not a strong link with business stakeholders, especially when the RI is totally public. Businesses could provide valuable consumer data to RIs. Thus it seems that a stronger link needs to be established with business to involve them as one of the main stakeholders of RIs. As a consequence, public-private funding model could be a potential approach.
- Current RIs seem to be designed to primarily serve researchers from the public domain and only to a secondary (if any) degree industry. New business models could include other customer segments such as business and end consumers while still having their main focus on researchers as the main customers.

Taking into account these insights, the following chapters will cover the definition of various business model archetypes (from a governance point of view), and consecutively the development of business model modules and alternatives as further steps.

4 Business model archetypes

In order to develop and design a business model, several elements need to be defined. In general, it is necessary to define the supply chain structure (in the case of the RICHFIELDS RI, this will encompass the identification of key partners that will be involved, the identification of key resources, and key activities needed to design and run the RI), the main services and value propositions which will be offered to the end-users as well as the type of final customers to be targeted, and the financial structure of the RI to ensure its economic sustainability (i.e., cost structure and revenue streams). In the case of the RICHFIELDS RI, there is also another important element to be defined that is related to the governance of the RI. Hence, there are three critical questions that need to be answered:

1) How will be the governance of the RI? Are we aiming to design a public RI? Do we intend to involve private partners, too, and design a public-private RI? Or are we aiming at designing a business-oriented RI which will turn into a private RI over time?

2) Who are the main targets customers of the RICHFIELDS RI as end-users?

3) What types of services do we want to offer to our customers and what are the value propositions that differentiate the RICHFIELDS RI from other similar RIs and bring end-users to our RI?

Notably, the governance question will also affect the definition of the next two criteria regarding the value propositions and the customer segments. Moreover, we believe that the type of governance of a RI can affect the scientific, social and economic impacts of the RI. Taking this into account, we define three main archetypes of business models for the RICHFIELDS RI by defining different types of governance for a public, a public-private, and a private business-oriented model. For each archetype, we define the main characteristics of the business model in general and the pros and cons.

4.1 Public RI

In this scenario the RICHFIELDS RI will be a public RI governed and run by public entities. The RI is initiated by the European Commission (EC) and will be founded by the EC and EU Member States interested in that RI. The target customers of the RI are only researchers from the public domain and scientists who will use the data of the RI for their scientific studies. Thus the range of offered services to the customers is limited to access to high-quality integrated standardized data (i.e. downloadable data or online access). The RI would be an open access RI. Since this model is a purely scientific-oriented model, it is supposed to have a high scientific impact. However, there are certain challenges in terms of providing data for the RI by involving different partners. It will be very challenging to collect a high variety of input data for the RI since it's very difficult to involve companies and include their business data in the RI. In fact, companies and business organisations are quite reluctant to get involved and integrate their data into such a model since they don't have a direct benefit or service in return. Also, in this scenario it is more challenging to sustain the RI economically since it is an open access platform entirely dependent on public funds. This could be perceived negatively by the EC as the funder of the RICHFIELDS project. Lastly, it is easier to have a tighter surveillance for such a public RI from an ethics point of view, in terms of its use of the data for scientific reasons and thus it seems less challenging to convince single individuals to share their personal data with the RI. Moreover, the compliance of ethical standards is easier to handle as the usage of data by industry is generally prevented and not possible.

A famous example for such a platform is the Eurostats platform, which provides official statistics and data on the European Union, EU member states and sub-state regions. Users can access data for free and, in order to access the bulk data, they just need to register on the website. The platform provides data of over four decades of statistical observations, varying by series and accession dates of EU member states.

Pros:

- Very scientific oriented
- High credibility due to tighter ethical surveillance
- Open access
- Less challenging to involve individuals to share their data

Cons:

- Limited range of data
- More difficult to sustain economically
- Very challenging to involve businesses and their data
- Limited range of services

4.2 Public-Private RI

This scenario implies the RI being governed by both public and private entities. Main customers of the RI are scientist from the public and private domain and others from the private sector. The partnership share might vary but at least 50% of it should be governed publicly (it can be more but not less) to ensure the ethical surveillance of the scientific use of the data. Due to the partly private partnership,

it is less challenging to include and integrate business data in the RI and thus the RI can offer a wider variety of data including both customer and business data. Therefore, the customer target segments will be broader as well. While the RI still targets scientists and researchers as the main data users, it can target other customers such as food manufacturers, app developers, private data companies, etc., too. Accordingly, the range of offered services and value propositions will be broader. Besides offering access to high-quality integrated data, other services can be offered such as on-demand consultancy for market research and data analysis, scientific newsletters and reports based on data analysis, as well as access to dedicated physical research infrastructures for companies (e.g. kitchens of future, labs, etc.). In this scenario, there is a need of a powerful public partner such as EC and governments of member states to monitor and ensure the scientific contribution of the RI and its ethical perspective to apply the data for the benefit of society. Meanwhile, the broader range of services opens up new revenue streams such as pay-per-service for companies and businesses. Moreover, some of the infrastructures such as labs, kitchens of the future etc. can be also accessed on demand by companies and as such generate revenue based on pay per access. As a conclusion,, the services will be a mix of free and paid services. This can eventually enhance the economic sustainability of the RI. Access to data can still be free for researchers and scientists in such a business model, however there is a mechanism to receive, control and approve the request for data access by the governing committee of the RI.

Pros:

- Broader range of data and easier access to business data
- Broader range of customers and service offerings
- Involving businesses as partners instead of having them as competitors
- More sustainable from an economic point of view

Cons:

- Not a purely-scientific direction
- Tight surveillance is required to ensure the ethical requirements and a scientific impact
- More difficult to convince individuals to share their data

4.3 Private RI

In this scenario, the RICHFIELDS RI will be designed to be supported by the project funding for a specific period of time, while afterwards it will transform into a private RI as a spin-off of the RICHFIELDS project. In this case, the RI will be funded only by private entities and organisations. This has to result in the creation of a very business-oriented platform which is focussed on ensuring its economic sustainability first and foremost, and only on a secondary level creating scientific impact. Thus, the range of service offerings by the RI will have to be much broader: from access to data, data consultancy, and data analysis to on-demand reports and studies, etc. All the offerings will be paid-services targeting different types of customers such as companies, app developers, researchers and more. In such a business model, the RI can be seen as a direct competitor to other data providers such as Innova Market Insights, MINTEL or Nielsen. It will be quite difficult to convince individuals to share

their data with this RI since the data can be used for economic or even commercial purposes and not only scientific ones. The business data should be acquired from data providers or they can provide data per on-demand service offering. Due to the business-orientation of this RI, it will be more difficult to have a tight surveillance of ethical issues to ensure social responsibility and scientific impacts. The credibility of the platform might be not very high as people trust less the compliance of ethical standards by industry. Since the RI will be a spin-off, it will operate in ways that ensure economic sustainability (and will also aim at generating profit) and thus will be run without no public-funding.

Significant examples of this business model are companies such as Nielsen and IPSOS. Nielsen collects data and measures which Consumer Packaged Goods (CPG) consumers purchase (and what those consumers look like - e.g. their demographics), and why they made those purchase decisions. This measurement enables companies like P&G, Unilever, Coca-Cola, and Vodafone to determine what product offerings they should provide, and how best to market them to consumers.

Although this business model does not seem aligned with the objective and orientation of the RICHFIELDS project, it's worth to be considered in this exercise.

Pros:

- Economically sustainable and no need for public funding
- Broad range of customers and service offerings

Cons:

- Business-oriented instead of scientific-oriented
- Very difficult to integrate individuals' data
- Big data companies as direct competitors
- All services are paid-services even for researchers

Going through pros and cons of the defined archetypes, it seems that public-private archetype can be selected as the basis to develop the business model alternative. A public-private model ensures the presence of both public and private entities within the governance of the RI. It also provides the opportunity of financing the RI not only based on public funds but also private funds provided by business partners of RICHFIELDS.

5 The process of generation of business model alternatives

Generation of business model alternative took place in a three-step process. In the first step a list of potential options which could be included within the business model were defined. These option were mainly defined based on the workshops and discussions taken place in project meetings (mainly Milano GA, Gothenburg GA and Den Haag workshop), Second stakeholders workshop and the output from phases 1 and 2 deliverables especially D5.1, D6.1, D7.1, D8.1, D8.4, D9.1 and D10.1. Having defined the overall options of business model, we concluded that main driver to start defining of the business model is the type of customers that RICHFIELDS RI will serve. In the other words, by focusing

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on the type of customers, it will be possible to define what type of value propositions will be given to the defined customer category, how, under which condition, and what are the requirements and resources to do that. Therefore in the second step, four business model modules were defined where each module considers a specific category of customer as the customers that will be served by RICHFIELDS. These defined modules are : 1) Researchers module 2) Business module 4) Consumers module 4) Policy makers module. However, in order to generate the final business model, it was not enough to have separated business modules. Therefore, in the third step the modules were combined with each other to generate different alternatives of business model targeting different types of customers. Figure 4 shows the process of business model alternatives generation.

5.1. Business Model Modules

In order to define business model alternatives, four main modules have been introduced. These
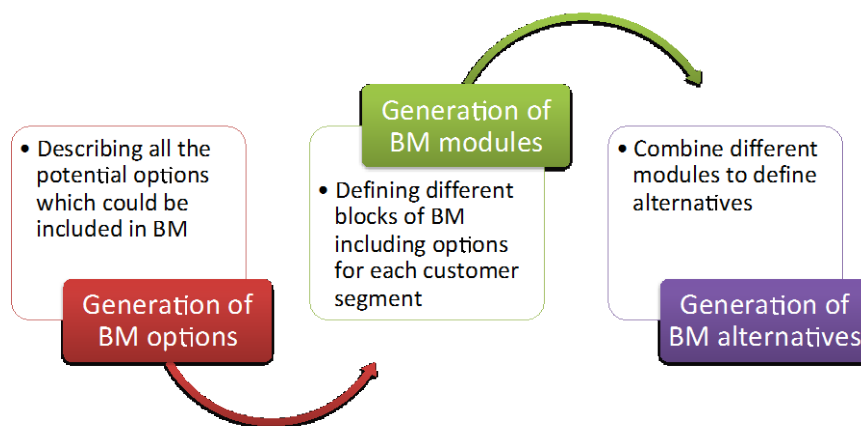

Figure 4. Process of generation of business model alternatives

modules can be combined in different combinations creating the business model alternatives. The modules have been defined based on the type of customer that the RI targets and to which will offer services. The four modules are: 1) researchers module, 2) businesses module, 3) consumers module, and 4) policy makers' module. Since the type of customer is different in each module, other elements of business model such as value propositions, key activities, key resources, etc. will be different to some extent from one module to another. This enables us to understand what are the differences in the RI business model if different types of customers will be served by the RI both from a conceptual point of view (T12.1) and from a economic, social and scientific point of view (T12.2). In fact, while most of the existing RIs already target researchers and policy makers, the added value of generation of these business model alternatives in RICHFIELDS and eventually in FNH RI will be to understand how the RI should be operated targeting business entities and consumers too. Section 6 of this deliverable will define how different building block for modules are designed.

5.2. Business Model alternatives

Having defined the four modules of business model, the business model alternatives can be generated by combining them. In order to do that we should, however, take into account two criteria. First, we should consider that the main mission of RICHFIELDS is to provide data and service to researchers to contribute to food, health and nutrition research. Therefore researchers should be always considered as the main customer segment of RICHFIELDS. This means that all the business model alternatives

need to encompass researchers module. Second, one of the important objectives of RICHFELDS is to affect policy definitions and provide the required input to define more effective policies in terms of food and health to eventually improve people's health. As we discussed n section 4 of this deliverable, RICHFIELDS RI is supposed to be a public-private RI meaning that public funding will be an essential part of RICHFIELDS revenue especially in the first years. In particular, RICHFIELDS will be designed based on the concept of national nodes of FNH RI meaning that initial public funding will be provided by some countries which will host the national nodes. Accordingly, provision of services to policy makers would be an essential part of RICHFIELDS and FNH RI as well. In this regard, policy makers will be always considered as customers of RICHFIELDS too. They are always one of the final customers which receive either the results of middle customers (such as researchers) or direct services from RICHFIELDS. Having in mind these two criteria we can generate four business model alternatives: 1) RI for researchers and policy makers 2) RI for researchers, policy makers and businesses 3) RI for researchers, policy makers and consumers 4) RI for researchers, policy makers, businesses and consumers. Generation of these four business model alternatives where everyone of them have different combination of customers, let us to understand (through assessment in T12.2) what would be the economic, social and scientific impacts of each alternative and consequently to select one of them and go further for the detailed design of the selected alternative in T12.3. Figure 5 shows these four business model alternatives.
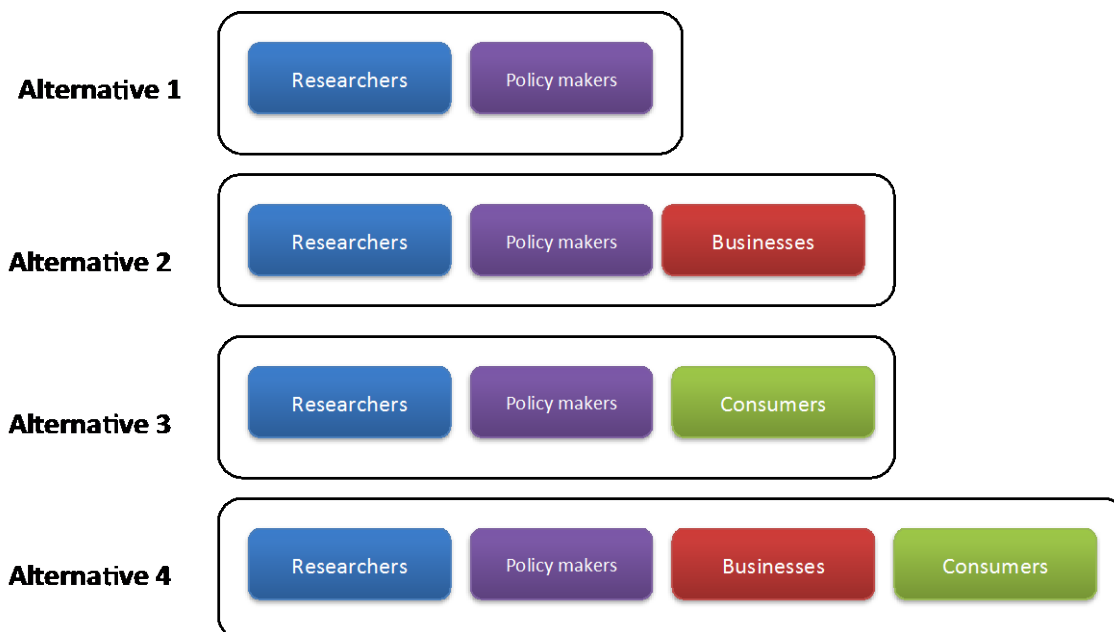
Figure 5. Business model alternatives

In the following section, we will define the design of each business model building block for each of the four modules. Definition of the business model for each module provides the required input for T12.2 to assess each module from economic, social and scientific perspectives. Thereafter it would be feasible to understand the differential impacts and assessment of each business model alternative considering that what will be the changes by adding module/s and generating different business model alternatives. Once again, it should be noticed that these are only modules, and the final

business model alternatives will be defined combining these modules and considering the criteria of RICHFIELDS (Figure 5).

6 Design of business model blocks for modules

6.1 Business model structure

The starting point of development of a business model is the definition of its structure. The structure of a business model describes its boundaries and illustrates the areas, which will be studied more in detail during the BM development process. As the reference structure of RICHFIELDS business model, we considered Osterwalder's business model canvas. This was mainly due to the fact that, the canvas is the most complete structure in terms of covering various aspects of the value chain. It emphasizes not only on value generation and internal activities of a company but also on upstream (partners) and downstream (customers) parts of the value chain. Figure 6 shows the Osterwalder business model canvas.

Figure 6. Osterwlader's business model canvas [7]

Although the business model canvas is a proper reference to design RICHFIELDS business model, however some modifications were needed to customise the canvas and create a business model structure aligned with the context of RICHFIELDS and FNH RI. Accordingly two major changes were included in the business model canvas: 1) The "channels" building block was removed from the canvas since in the case of RICHFIELDS as a research infrastructure, the channel through which services are offered to customers are quite clear which is the consumer data platform. Thus the channel is the same for all types of customers 2) "Customer relationship" block was removed from the canvas since this building block mainly deals on defining how a company plans to establish a relationship with its customers. In the case of RICHFIELDS, the important point would be managing the communication with RICHFIELDS customers which will be already considered in the building block of "key activities", therefore the "customer relationship" block was removed 3) A new block of "governance" was added considering the importance of governance aspect on design of business model. The "Governance" building block will not go into detail of governance issues, since the issues will be fully studied in WP13,

but it will include a general view on the governance side of the RI in terms of its interaction with business model.

Figure 7 illustrates the modified business model canvas for RICHFIELDS.
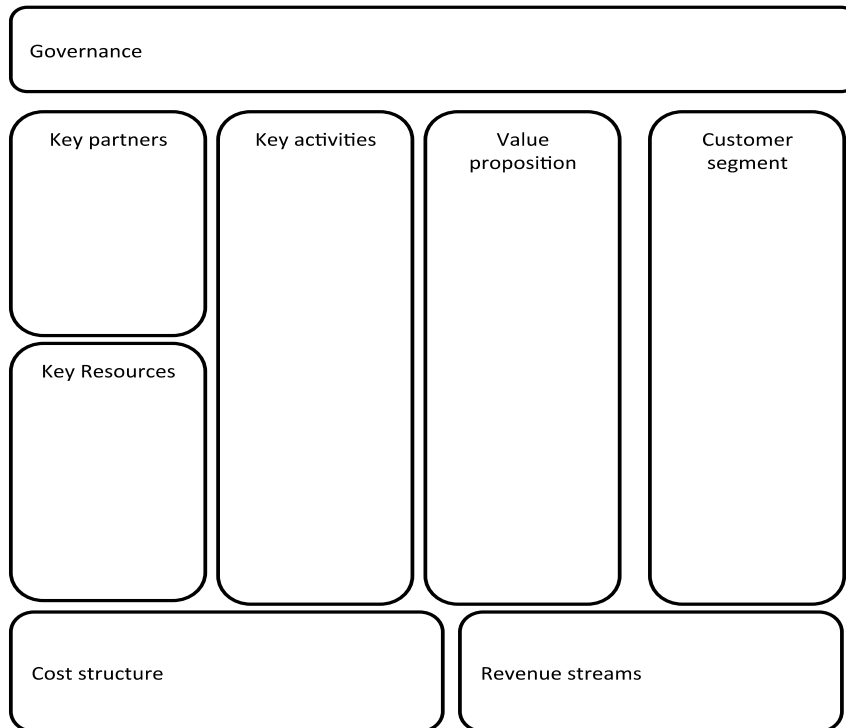
Figure 7. RICHFILEDS business model canvas

Here is a brief description of each business model building block:

- Customer segment: defines the types of customers that RICHFIELDS will target

- Value proposition: As a major block of the BM canvas, value proposition characterizes type of service offerings that RICHFIELDS will offer to different segments of customers to satisfy their needs and requirements.
- Key activities: The main activities to be carried out by RICHFIELDS to create and offer value proposition are pinpointed in this block. Key activities relate to the internal activities of a company to manage offering of services within their whole Lifecycle, from service generation to the delivery of service.
- Key partners: The block of key partners describes the main suppliers and partners that RICHFIELDS should deal with to create the value proposition.
- Key resources: This block identifies the required assets, including physical, human and financial resources, which support RICHFIELDS to implement its strategy, create its value propositions, deliver it to customers and achieve its strategic goals.
- Cost structure: This block describes all costs incurred to operate a business model. In other words the block pinpoints those relevant elements of the business model in terms of cost structure.
- Revenue streams: The block outlines the main method through which RICHFIELDS will

generate revenue

- Governance: The block outlines the operational and structural governance of the RICHFIELDS RI in a general perspective since the detailed study will be done in WP13.

6.2 Design of business model building blocks for modules

In this section, we will design each building block of business model by defining the options for that building block. We do the design of each building block for all four modules (researchers, businesses, consumers, policy makers) in a way that it would be also possible to trace the possible differences in the final design of the building block among different module.

6.2.1. Customer Segmentes

Customer segment has been the main driver to define the modules of business model. In this light, it is quite clear that which are the categories of customers that RICHFIELDS will target in each module.

6.2.1.1. Researchers module

Within this module, researchers are the only customers of RICHFIELDS. This includes researchers from all types of research organisations. Research organisation means an entity, such as university or research institute, irrespective of its legal status (organised under public or private law) or way of financing, whose primary goal is to conduct fundamental research, industrial research or experimental development and to disseminate their results by way of teaching, publication or technology transfer; all profits are reinvested in these activities, the dissemination of their results or teaching; undertakings that can exert influence upon such an entity, in the quality of, for example, shareholders or members, shall enjoy no preferential access to the research capacities of such an entity or to the research results generated by it. Thus, the range of customers includes researchers from universities, non-academic research institutes for public health and food science (e.g. JSI, INRA, etc.), other research infrastructures (e.g. EUROFIR, etc.), and other research entities.

6.2.1.2. Policy makers module

In this module, the customers of RICHFIELDS are policy makers at both national and EU levels. At the national level, policy makers fund the national nodes, and thus expect specific service offerings from RICHFIELDS and in a more general level FNH RI. At the EU level, the European policy makers in terms of food, nutrition and health would be also the customers of RICHFIELDS.

6.2.1.3. Business module

"Business module" targets companies and business entities as the only customers of RICHFIELDS. These business entities include:

- Apps and software developer companies: that operate in fields of nutrition, food and health dealing with collecting of consumers' data.
- Food chain companies and retailers
- Market data companies
- Private data platforms
- Labs and private research facilities of businesses
- Restaurants & Caterings
- Freelance experts such as dieticians, nutritionists, etc.

- Etc.

6.1.2.4. Consumers module

Consumers are the target customer segment in this scenario. In general, consumer refers to a person who buys goods or services for their own use. In the context of RICHFIELDS, consumers refer to individuals and citizens buying and consuming food products. In particular customers can be divided into two main groups:

- Consumers
- Civil society organisations as consumers representatives

6.2.2. Value Proposition

RICHFIELDS offer different types of value propositions to different segments of customers that have been defined in section 6.2.1. The value propositions are service offerings that are designed to satisfy the specific needs of each customer segment. In particular vale propositions are products and services that create benefits and added value to customers and address their problems and needs. Figure 8 shows the value proposition canvas in which the link between customer segment and value propositions is illustrated.
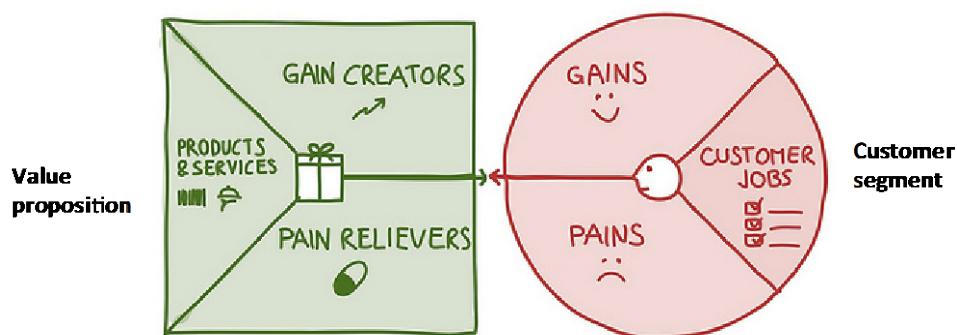
Figure 8. Value proposition canvas [14]

The value propositions for each module are described in following. These value propositions have been defined based on broad analysis and discussions during several projects meeting which have been already listed in section 3 of this deliverable. Moreover, we also used the second stakeholders workshop to validate a part of value propositions that we had defined by that time with external stakeholders trying to understand their needs and requirements. The final list of value propositions defined in this section will be presented for validation and modification in the third stakeholders workshop which take place on 11 December 2017 in Brussels as one of the first steps of T12.3 which is related to detailed design of business model.

6.2.2.1. Value propositions for Researchers module

Based on the broad discussions in several workshops during plenary meetings of RICHFIELDS project (e.g. Milano Plenary meeting, Gothenburg plenary meeting, Lyon plenary meeting), phase 3 workshops and the outcomes of the second stakeholders workshop held in Brussels on 4 April 2017, researchers deals with several barriers and problem in terms of food data mainly, lack of standardised

high quality integrated big data, lack of data traceability, lack of replicability, fake data, etc. Therefore their main need is to have access to harmonised integrated data, which are traceable and replicable. Accordingly the main value proposition offered by RICHFIELDS to researchers will be access to harmonised integrated food data. Meanwhile, other value propositions will be offered by RICHFIELDS as well to satisfy other needs of researchers, such as training services, access to protocols, ontologies, and semantic models; and networking. These additional value propositions would also support the economic sustainability of RICHFIELDS through generation of additional revenue apart from revenue from data access (RICHFIELDS membership). In following we define the value propositions researchers more in detail.

Value proposition 1: Access to high quality harmonised integrated data

Access to data is the main value proposition of RICHFIELDS which is realised through RICHFIELDS platform. Through the platform, RICHFIELDS provides access of high quality harmonised integrated micro data sets to researchers in two ways: 1) RICHFIELDS acts as a gateway to provide and directing researchers to various food-, nutrition- and health-related micro data sets in different data sources which could be curated according to Richfield protocols 2) RICHFIELDS provides individual consumer micro data sets which are directly collected from consumers by RICHFIELDS app. These data will be curated, harmonised and integrated into the data repository of RICHFIELDS which in European Open Science Cloud.

By high quality data we mean data, which is properly curated, if needed also pre-processed, cleaned and/or transformed/structured, and fully documented with metadata and provenance data. All this data are ethically obtained and governed during its lifecycle based on the requirements that will be defined in WP13. The platform gives an opportunity to researchers to have access to broader micro data sets, which contains scientifically reproducible and traceable data, as well as, integrated or aggregated with other data. The platform offers a unique added value to researchers by providing high quality data, based on open and big data on consumers' behaviour related to food, nutrition and health. While RICHFIELDS makes available computer files of food composition data extracted from source documents, it also offers tailor-made data packages such as food data from one or several RICHFIELDS data providers (based on geographical location, type of provider, etc.).

Researchers can have access to data in two different ways. First way provides them a direct access to individual consumer data collected by RICHFIELDS app and stored in RICHFIELDS platform. In this case, researchers can reach the platform, search for their desired data and download/access it directly from RICHFIELDS platform. The second option provides an indirect access to data for researchers. In this case, specific agreements will be made with data providers so that RICHFIELDS can act as a gateway to bridge researchers to data suppliers. In this way, researchers can look for their desired data sets within RICHFIELDS platform and will be redirected to the data sets (not stored in RICHFIELDS) to access data. Moreover, there is the possibility of linking this type of data (not stored in RICHFIELDS) with data sets which have been already stored in RICHFIELDS data repository. This can be feasible upon the agreement with data supplier to link its data with RICHFIELDS data. The linked data will be stored in RICHFIELDS in case the permission is given by data owner, otherwise it won't appear in RICHFIELDS data repository. Figure 9 shows the above mentioned ways to access data through a schematic

approach. A more detailed presentation of how the RICHFIELDS platform operates technically is given in Deliverables of WP11.
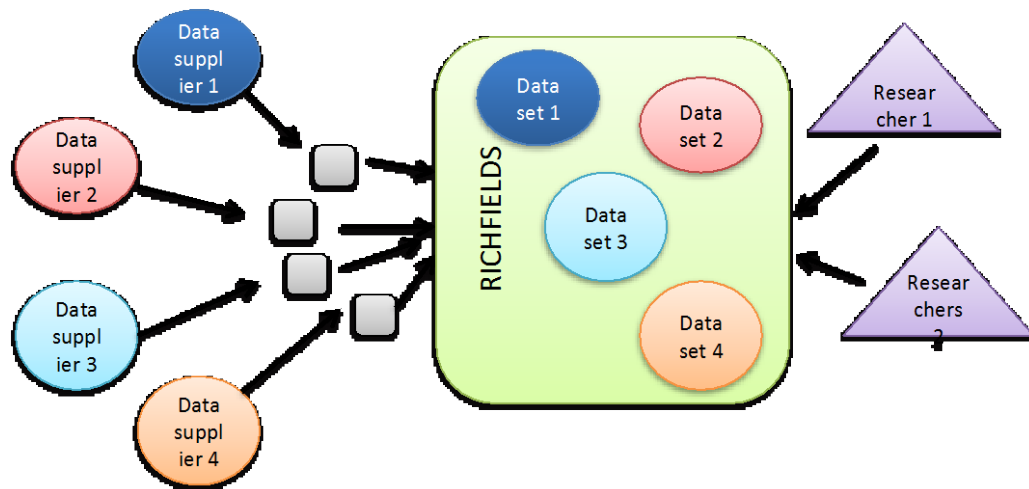
Figure 9. RICHFIELDS Hybrid model to access data

Value proposition 2: Access to research protocols, ontologies, semantic models and vocabulary/thesauri

RICHFIELDS offers protocols on best practices on research into determinants of consumer behaviour including use of big consumer data for research. These protocols also include methodology for data harmonisation, data categorisation and indexing, food image recognition, etc. In general the protocols that are offered to customers can be divided into three main categories:

1. Protocols for data collection: protocols and procedures of data collection mainly meta data for researchers who want to integrate their data into RICHFIELDS RI such as data categorisation
2. Protocols for data integration: protocols on how to integrate big data especially about data harmonisation, data curation, etc.
3. Protocols for data analysis: protocols and methods on how to analyse the collected data

Besides protocols, the newly developed RICHFIELDS semantic data model that includes standardised vocabulary (taxonomy), thesauri and food ontology can be also considered as a part of protocols and value propositions offered to researchers. RICHFIELDS offers its users a standardised vocabulary (taxonomy) and thesauri that have been developed within the project to describe the data semantics including data provenance and its quality.

Value proposition 3: Training

Along with the authoritative materials offered by RICHFIELDS, training services are another value proposition to researchers in order to provide them with the required knowledge and know-how to use the materials. Customers will receive training on how to use RICHFIELDS platform. Moreover,

training services will be offered on how to use protocols and the RICHFIELDS semantic data model (i.e. taxonomy, ontology, etc.). Meanwhile, training on different analysis methods for data analysis consists the other part of training services.

Value proposition 4: Access to labs and physical facilities

Being a member of RICHFIELDS, researchers can have access to hard facilities, labs and physical infrastructure that collaborate with RICHFIELDS as partners. Researchers can use these labs and facilities, which are not usually accessible to other institutes to collect data and to conduct advanced research in food, nutrition and health domains.

Value proposition 5: Networking and community building

RICHFIELDS offers networking and community building services to researchers by:

- Creating an online forum: The online forum will be a place for researchers to network and exchange information
- Establish links between researchers and data suppliers: where researchers need to have a direct contact with data suppliers of a specific data set, RICHFIELDS provides such a link. This can be also in cases when data suppliers would prefer to negotiate directly with customers on the terms and conditions to provide data to them.
- Annual communication events: RICHFIELDS organises communication events on a regular basis such as conferences, workshops, seminars, etc. where researchers can participate, network, exchange information and build a stronger community.
- Create an environment to facilitate access of researchers to hard research infrastructures, such as restaurants of future, research labs, etc.
-

Value proposition 6: Access to documents repository

Besides its data repository, RICHFIELDS owns a documents repository through which it provides access to published and unpublished source documents to its customers, as well as making documents produced by members more readily available to all users. Moreover, the documents repository contains reports, newsletters and other generated documents by RICHFIELDS.

6.2.2.2. Value propositions for policy makers

As a major customer segment of RICHFIELDS, policy makers should receive service offerings which can affect future policy definitions and provide a solid understanding of the impact of RICHFIELDS activities as a research infrastructure which is partly publicly funded. RICHFIELDS offers the following value propositions to policy makers.

Value proposition 1: Access to a performance dashboard

A major part of initial funding for RICHFIELDS will be generated through public funds. In this regard, policy makers as the key investors in RICHFIELDS need to receive tangible feedback about the performance of RICHFIELDS and its impacts. RICHFIELDS will provide a performance dashboard accessible to policy makers where they can have a general overview of RICHFIELDS activities, progress

and the impacts it creates in food, nutrition and health at national and European level. This is particularly very important to be provided to the policy makers whose member states are included in national nodes of FNH RI.

Value proposition 2: On-demand analysis and recommendations

RICHFIELDS can support policy makers to define future food, nutrition and health policies providing them input from the results of advanced research which will be carried out thanks to RICHFIELDS. This input can be results of advanced research done by researchers, or carrying out on-demand analysis in a specific FNH area to provide policy recommendations to them.

Value proposition 3: Definition of new streams of research

Thanks to service offering provide by RICHFIELDS to researchers, especially through providing them with individual consumer data and business generate data, it is expected that new streams of research could be defined as a result. Accordingly definition of these new streams of research for FNH will result in improvement of public health in member states.

Value proposition 4: Access to documents repository

Via RICHFIELDS platform, policy makers can have access to a document repository where they can find the latest newsletters and reports in the fields of food, nutrition and health and the latest results of RICHFIELDS research.

6.2.2.3. Value propositions for business

The offered value propositions to business customers should be defined in order to satisfy the specific needs of business entities. In particular, businesses are interested to access to information which can result in improvement of their product/service features. Accordingly the value propositions that RICHFIELDS will provide to business customers are defined in following.

Value proposition 1: Access to aggregated high quality integrated data

RICHFIELDS provides the opportunity for business entities to access to high quality aggregated data collected via RICHFIELDS app stored in RICHFIELDS platform. Moreover RICHFIELDS will act as a gateway to introduce and direct them to the other data sets stored in its data providers' servers. Based on the agreement with data suppliers, companies who are members of RICHFIELDS can have access to aggregated data provided by a range of data suppliers. In this regard there is a need for a tight ethical supervision of data access to business entities. For some business entities such as app and software developers as well as freelance experts access to aggregated data would be useful to improve their products and services. For instance app developers can use standardised harmonised data of RICHFIELDS to develop or improve specific features of their products. In case of some key food manufacturers RICHFIELDS can act as a bridge/third trusted part for data exchange. An example is an issue which has been learnt in DISH-RI regarding this. For instance Company A and B (as two key players in food market) want to standardise and pool data from their research in developing countries. Currently company A does a survey in Thailand to get access to the market for a product with e.g. a probiotic (with EU standard definitions) and company B does it in Mexico (with US standards). They

want to exchange that, so that they not have to do all the work in all countries (and do it double), but a direct exchange is not so easy (competition rules etc.). RICHFIELDS could act as a third trusted party.

Value proposition 2: Linking own data to other data sets

Through its protocols, RICHFIELDS can provide the business entities the opportunity to make their data harmonised and standardised and thus get them linked with other data sets. This not only gives them the opportunity to have access to a broader set of data, as explained in the previous value proposition, but also to be able to potentially increase their data selling. This could be particularly the case for mobile applications that one of their main revenue streams is selling collected data through the app.

Value proposition 3: Consultancy and data analysis

RICHFIELDS offers businesses consultancy services in terms of analysis of specific data sets of the RI. In this regard, RICHFIELDS can provide its business customers with generated patterns, trends and similar on-demand analysis. Such a service would be of interest of business customers since in many cases they own data, however they do not have the competency to use their data. RICHFIELDS will offer them this service through its harmonised integrated data sets and competent resources for data analysis. Businesses such as apps, restaurants and caterings can use this service improve their offerings, products and services to their customers. For software and app developers access to standardised and harmonised data analysis is quite essential when it comes to develop and underpin a new product. Food chain companies and retailers can use this service not only to improve their products and services but also to reduce cost and increase efficiency thanks to access to analysis of data from suppliers and other actors through out the supply chain.

Value proposition 4: Training

Likewise training offered to researchers, business customers would receive training on how to use RICHFIELDS platform, protocols, semantic data model and data analysis methods. This would be especially useful for freelance experts.

Value proposition 5: Networking

RICHFIELDS provides its business customers with the opportunity of networking through establishing links between business and researchers as well as data suppliers and data users. The link can be mutual meaning in some cases when a specific business has some specific data sets which are in interest of a specific researcher/s, and the data sets are not stored in RICHFIELDS platform, RICHFIELDS acts as a broker establishing the link between the researcher/s and the business entity for further agreements on using/acquiring data. In some other cases, when a business needs a specific set of data from one or more data suppliers, RICHFIELDS creates the link for the business entity to negotiate if they can acquire data from the supplier.

Value proposition 6: Quality label

RICHFIELDS can provide app developers and mobile applications with a quality label when they are aligned with RICHFIELDS protocols to collect their consumers data. Having the label, enables the app

developers to be able to link their data with the other apps holding a quality label and acts a brand reputation for the mobile application.

Value proposition 7: Corporate social responsibility

Corporate social responsibility is becoming more and more an important and critical issue for companies. Being a partner of RICHFIELDS, business entities can reinforce the branding image of companies in terms of CSR since they could reflect this as helping the clients and governments to create a healthy food environment by making their data available to RICHFIELDS.

Value proposition 8: Access to documents repository

Likewise researchers, businesses can have access to RICHFIELDS documents repository where they can find different published and unpublished documents in terms of food, nutrition and health data.

6.2.2.4. Value propositions for Consumers

RICHFIELDS consumers data platform is designed to be an e-RI to provide harmonised standardised data. This would be a unique and valuable value proposition for researchers and to business organisations. However, when it comes to consumers, this would not provide any direct tangible benefit for them. In the other words, consumers are not interested to access to data, but they are interested to receive final tangible and quick services and benefits as a result of collection, analysis and interpretation of data. Thus what consumers seek are knowledge and information. The value propositions that RICHFIELDS will provide to individual consumers are as following.

Value proposition 1: general and personalised advice on food, nutrition and health aspects

RICHFIELDS will provide individual consumers a set of advice on food, nutrition, and health aspects. These recommendations will be outputs of the analysis and research carried out based on the data provided thanks to RICHFIELDS RI. RICHFIELDS would provide both general and personalised advices to consumers based on their type of membership. These personalise advices will be provided to them thanks to the personalised data that they share with RICHFIELDS through RICHFIELDS app.

Value proposition 2: Access to documents repository

Via RICHFIELDS platform, consumers can have access to a document repository where then can find the latest newsletters and reports in the fields of food, nutrition and health and the latest results of RICHFIELDS research. Latest knowledge and scientific contributions will be delivered to consumers in an easy-to-understand way so that it would be practical and useful in their daily life.

Value proposition 3: Online forum

Within RICHFIELDS platform, consumers will have access to an online forum where they can share their personal experiences in terms of food consumption, purchase and preparation with other consumers and also other customers of RICHFIELDS. The forum will be a place to exchange ideas, raise questions and raise awareness about food, health and nutrition. RICHFIELDS experts will provide consumers with insights and feedbacks about their doubts and questions.

Value proposition 4: Their impact on citizen science

Consumers who are members of RICHFIELDS will be updated on a regular basis about the contribution they make to progress in science and citizen science through the personal data that their provide to RICHFIELDS.

6.2.3. Key Activities

In order to deliver the defined value propositions to each customer segment, several key activities need to be executed. These key activities define the main operations which are critical to create and deliver the value proposition to customers. Apart from the type of customers who will be served by RICHFIELDS, a set of key activities are common. Accordingly, in all the defined modules for researchers, policy makers, businesses and consumers we need a set of standard activities. These standard key activities are described in following. Thereafter, the specific key activities which are related to type of customer will be defined separately for each module.

- **Identification of data suppliers:** the activity relates to identification of the potential data suppliers for RICHFIELDS and categorizing them based on their influence and priority. These data suppliers can be research entities, business entities or individual consumers. Thereafter, RICHFIELDS needs to define the proper data providers to be contacted. This activity should be done on a regular basis and new data providers need to be identified. A procedure to identify, evaluate and access potential data providers can be defined at this step.

- **Negotiation and data acquisition:** Based on the previous activity, RICHFIELDS should contact data suppliers to initiate the data acquisition process. The acquisition of data can be done following different approaches which are going to be defined more in detail in section 6.2.4.2 of this deliverable. RICHFIELDS starts negotiating with data suppliers and making agreement of the exchange condition of data. This can be done on the level of data use or data interlinking between different data sources.

- **Definition of protocols for data collection and data harmonisation:** RICHFIELDS needs to define protocols which can be used to collect data by RICHFIELDS app and also to be used to be communicated to data suppliers in order to ensure the possibility to integrate different data sources and harmonising data.

- **Data quality assessment and data curation:** While the data are acquired from individual consumers via RICHFIELDS app, the data provenance information will be collected in the form of meta data thanks to the data provenance ontology developed in WP11. Thereafter they will be curated to guarantee the same quality of meta data. Data curation needs to be done during the whole lifecycle of data from the initial storage phase of data in RICHFILEDS to its archiving and till the data gets obsolete and need to be deleted.

- **Data harmonisation:** Where possible, the data will be harmonised with other data and linked to RICHFIELDS RI. This will be done through the RICHFIELDS ontology developed in WP11. As an example, if one dataset on food intake will be described using the FoodEx2 system and another dataset on food composition will be described using the LanguaL system, harmonisation of these two datasets will be based on the mapping of FoodEx2 to LanguaL terms as defined by the RICHFIELDS taxonomy and ontology. The ontology defines rules on how to link/harmonize data from datasets described in different ways.

- **Elaboration of thematic/periodic reports:** RICHFIELDS will provide periodic reports about the activities done within the RI, new research areas, collaborations, projects and partnerships which are taken place thanks to RICHFIELDS.
- **Platform running:** A major activity relates to day by day running and operation of RICHFIELDS platform as well as its maintenance. This includes several sub activities such as coordination of several activities, administrative activities, financial management of the platform, supervising technical operation of the platform, etc. Moreover, this activity also includes running the RICHFIELDS app to collect consumer data directly. The development of mobile application can be outsourced, however a tight supervision from RICHFIELDS side is required to ensure the effective running of app and data collection process.
- **Coordination among national nodes and the central hub:** FNH- RICHFIELDS RI will consist of several national nodes which are connected to the central hub of RI. In this regard, coordinating and alignment between these national nodes and ensuring their concrete link with the central hub is a major activity.
- **Legal and ethical supervision of platform**: RICHFIELDS strongly considers respecting the legal and ethical perspectives especially regarding data. Therefore, supervision on legal and ethical function of the research infrastructure to guarantee liability, accountability and transparency of how data are acquired, stored and accessed is of a high importance for RICHFIELDS. More details in this regard are defined in deliverables 13.1 and 13.2.
- **Customer relationship management**: managing relationship with customers is a crucial activity that ensures not only retaining of current customers but also attracting of new potential customers. In this regard, it is essential to manage and analyse customers interactions and data throughout the customer lifecycle in order to improve the relationships with customers, retaining them and attracting more customers.
- **Communication activities:** RICHFIELDS has to disseminate and communicate its RI to raise awareness, attract potential data providers, disseminate and eventually grow. Planning and operating these communication activities such as advertisement, dissemination activities, social networks and media establishment is considered as key activities for RICHFIELDS RI. Moreover, RICHFIELDS should organise frequent events such as conferences, workshops, etc. and to provide the opportunity of networking to its customers.

6.2.3.1. Key activities for researchers module

Additionally to the standard key activities, the following key activity is required to deliver value propositions to researchers.

- **Organising of training services and courses:** a major value proposition to researchers is providing them with training services about protocols, semantic model, data analysis methods, etc. To deliver the value proposition, RICHFIELDS needs to plan and organise the training contents, services and courses.

6.2.3.2. Key activities for policy makers module

Additionally to the standard key activities, the following key activities are required to deliver value propositions to policy makers.

- **Consulting on policy recommendations and results of research studies:** RICHFIELDS needs to carry out data analysis and consultancy employing competent resources to provide policy makers with proper policy recommendations and insights about the FNH research studies within RICHFIELDS.
- **Performance and Impact analysis:** Regular analysis of performance of RICHFIELDS as well as actual and potential impacts of RCIHFIELDS activities need to be done in order to be communicated to policy makers via performance dashboard.

6.2.3.3. Key activities for business module

Additionally to the standard key activities, the following key activities are required to deliver value propositions to business entities.

- **Consulting on quantitative research:** RICHFIELDS will exploit competent resources, scientists and data analysts to perform on-demand analysis for businesses based on their specific needs and requirements. The consultancy service might contain several aspects such as market analysis, consumer consumption analysis, consumer purchases analysis, etc. The consultancy includes organisation of training services as well.

6.2.3.4. Key activities for consumers module

Additionally to the standard key activities, the following key activities are required to deliver value propositions to consumers.

- **Data analysis, reports generation and consumer consultancy:** Through this activity RICHFIELDS will exploit competent resources, scientists, dieticians, data analysts and other experts to perform both general and on-demand analysis based on customers' requests. This will result in generation of general newsletters, reports, advices and articles as well as personalised recommendations for consumers.

6.2.4. Key Partners

Key partners refer to the network of suppliers and partners that make the business model effective considering that partnerships are instrumental in making a business success or a failure. Thus, key partners are those critical partners that their partnership is crucial for running RICHFIELDS and delivering the value propositions to customers. Accordingly RICHFIELDS has two main types of key partners, 1) data suppliers 2) ICT infrastructure suppliers.

6.2.4.1. ICT infrastructure suppliers

Suppliers of big data infrastructure and ICT infrastructure are considered a key supplier for RICHFIELDS. ICT infrastructure suppliers are the companies that supply the required infrastructure to establish and run RICHFIELDS e-RI. This includes suppliers of big data servers, servers for running data analytics and semantic model, networking hardware, etc. The RICHFIELDS RI is mainly depends on the ICT infrastructure to store data from the RICHFIELDS app, link big data and eventually harmonise and integrate data. Therefore suppliers of these infrastructures are critical partners for RICHFIELDS. This also includes the developer company of RICHFIELDS mobile application. Their services have most likely to be bought under commercial conditions.

6.2.4.2. Data suppliers

Data suppliers refer to the entities that own data and on specific conditions and agreements (which will be discussed further in this part) agree to donate or/and integrate their data sets with RICHFIELDS. Data suppliers can be categorised into three main types of suppliers 1) research entities 2) business entities 3) citizens/consumers and civil society organisations. RICHFIELDS aims at including all these data suppliers in its business model to ensure providing a proper added value to its customers through offering them both individual consumers micro data sets and business generated data. Thus, in all the modules we consider all these three categories as the data suppliers that RICHFIELDS will deal with. However, depending on the type of customers RICHFIELDS serving and thus the value proposition it offers, the condition under which data will be acquired from data suppliers might be different. In following we will describe more in detail each category of data suppliers and define the type of business relation to be established with each category to acquire data. Hence, the following information about data suppliers can be considered valid for all four business model modules (researchers, policy makers, business, consumers); however, We will clarify that which business relationship is possible to be established in which business model module.

6.2.4.2.1. Category 1- Research entities

Research entities refer to all organisations means an entity, such as university or research institute, irrespective of its legal status (organised under public or private law) or way of financing, whose primary goal is to conduct fundamental research, industrial research or experimental development and to disseminate their results by way of teaching, publication or technology transfer. Research entities that can be considered as data supplier for RICHFIELDS are:

- Research infrastructures which have available food-, nutrition- or health-related data that can be linked to RICHFIELDS. These research infrastructures could be public such as EUROFIR and national data platforms of EU member states as well as private and public-private ones.
- Research organisations, both public and private, that own data collected via the externally and internally funded research projects. These include universities, research centres, and any other research organisations.

How to acquire data from research entities?

Data from research entities can be acquired in one of the following ways:

- Offer free/discounted membership of RICHFIELDS
- Agreement on acknowledging them when the data is used for scientific publication by user researchers (joint scientific products)
- Some research entitles might be willing to share their data considering the Open Data trend which is expected more and more from research funders
- Purchase data when none of the above mentioned points are accepted by the data supplier

6.2.4.2.2. Category 2- Business entities

Business entities refer to all those entities which deal with data collection and data use with a business-oriented objectives. In contrast to research entities, the business entities primary goal is to generate profit. Thus they use data to improve their product features, improve their value propositions, improve efficiency and effectiveness and eventually generate more revenue and profit. Business entities that can be considered as data suppliers for RICHFIELDS are:

- **Apps and software developers:** Food and heath mobile applications and software that collect consumer data in terms of purchase, preparation and consumption. An extensive list of these applications are available in deliverables 5.1, 6.1 and 7.1 as well as in RICHFIELDS Inventory Management systems (RIMs).
- **Market data companies:** market research companies which collect consumer data along the whole supply chain and establish their own data platform providing their customers (retailers, food companies, etc.) with data and marketing services to improve their performance such as ACNielsen.
- **Private data platforms:** refer to data platforms which are established by businesses aiming at creating data pools enabling countries across the supply chain to share standardised data such as GDSN platform developed by GS1.
- **Food chain companies and retailers:** food producers and distributers such as food manufacturers, supermarkets, etc. that own consumers' purchase data.
- **Labs and private research facilities of businesses:** refers to laboratories and facilities that collect and integrate data not having the primary goal of research. These entities would use data for their internal use and improvement of company performance.
- **Caterings & restaurants:** could be data suppliers to RICHFIELDS in terms of consumers food consumption.
- **Private consumer panels:** are groups of consumers recruited by companies who are used to answer specific research questions related to product purchase, preparation and consumption.

How to acquire data from business entities?

RICHFIELDS can acquire data from business entities through following ways:

- Offer networking and brand awareness by acknowledging them as RICHFIELDS partners;
- Convincing them to provide access to their data as part of their Corporate Social Responsibility program and as to postpone government regulation of food consumption or at least to have it based on correct data (especially for retailers, out of home catering and restaurants and food manufacturers);
- Agreement on acknowledging in joint scientific products whenever the business entity is interested in that such as to private labs & research facilities;
- Offer free/discounted membership of RICHFIELDS RI;
- Offer free/discounted services such as data analysis, consultancy and training in case they are not interested in membership;

- Purchase data when none of the above mentioned points are accepted by the data supplier.

6.2.4.2.3. Category 3- Citizens/consumers and civil society organisations

Citizens/consumers are an important type of data suppliers for RICHFIELDS since they can share their personal data directly using the RICHFIELDS app. Meanwhile, consumer data can be acquired through civil society organisations as their representatives too. Accordingly the main types of data suppliers are:

- Consumers (directly through RICHFIELDS app)
- Civil society organisations
- Public/governmental organisations

How to acquire data from citizens/consumers or their representatives?

- Free membership
- Free/discounted service offering of personalized FNH recommendations
- Acknowledge and advertise consumers representatives such as NGOs as the partners of RICHFIELDS
- Convince them to donate their data to help researchers to carry out advanced research studies and policy makers to set better FNH policies which will result in a better public health situation in member states and to affect the citizen science

6.2.5. Key Resources

Key Resources describe the most important assets required to make a business model work. These are the resources that allow RICHFIELDS to create and offer its value propositions, reach markets, maintain relationships with customer segments, and earn revenues. In other words, key resources are crucial resources to execute the key activities and deliver the value proposition to customers. There are three main categories of key resources for RICHFIELDS namely physical, human and financial resources. In order to do the standard key activities that have been described in section 6.2.3 a set of standard key resources are required. These resources are common among all the four modules. Additionally to these resources, there are some specific resources that are required while taking into account specific key activities of each module. These specific resources will be described in the following section. The standard key resources for RICHFIELDS are presented in following section.

6.2.5.1. Physical resources

The main key physical resources for RICHFIELDS are ICT and big data infrastructure. RICHFIELDS provides harmonised integrated data to its customers. Figure 10 shows the concept of RICHFIELDS e-RI. In this regard, specific IT infrastructure is required to create, run and maintain the platform. The required physical resources are as following:

- Proxy server with a data supplier portal and a data user portal. All these building blocks should
    - ✓ Be hosted in Europe
    - ✓ Have an official digital certificate
    - ✓ Be based on an open source configuration

- Data storage
- Cloud big data servers
- Server(s) for running the semantic model
- Server for running services (analytics)
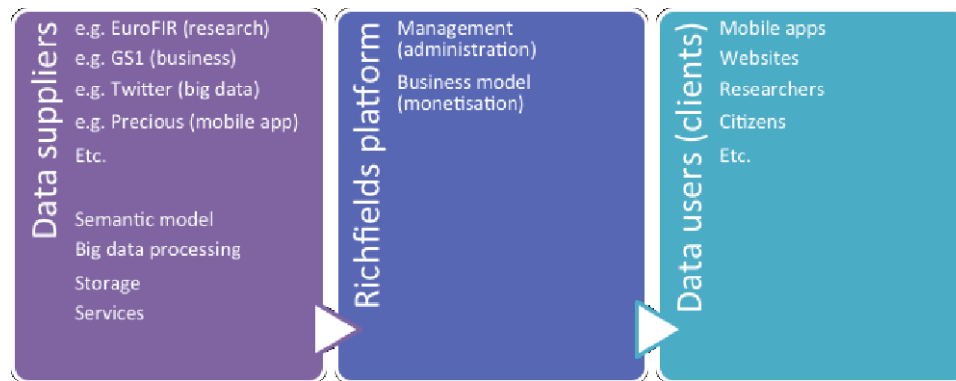
Figure 10. The concept of the RICHFIELDS e-RI as a proxy

6.2.5.2. Human resources

The key human resources required for RCHFIELDS include:

- ICT specialists for different tasks such as operation, running and maintenance of the platform and RI. This includes:
  - (Big) data specialists
    - Data project manager
    - Data scientists
    - Data modellers/architects
    - Data engineers
    - Data integration specialists
    - Data analysts/statisticians

  - Developers
    - Team leader
    - UX (User Experience) designers,
    - Platform/security/JavaScript/Agile/parallel and distributed systems/Big Data/Open Source/system developers
    - Software engineers

  - System/network administrators
  - Client support/helpdesk

- Experts (non-ICT) for identification of proper data suppliers and initiate acquisition process
- Experts from nutrition and food science
- Communication experts to manage communication activities of the RI

- Administrative experts to manage the administrative activities of the RI
- Legal expert to manage legal activities of RICHFIELDS
- Staff to run each national node

6.2.5.3. Financial resources

The key financial resources are the initial financial resources for investment and establishing the RICHFIELDS RI. These resources are:

- Public funds from members states governments or regional governments, this includes funding from national nodes in FNH RI
- EU funds to support establishment of RI
- Private funds from private companies and entities

6.2.5.4. Additional resources for policy makers module

Apart from the standard key resources, the policy makers module require the following human resources:

- Experts to do data analysis to provide policy recommendations

6.2.5.5. Additional resources for business module

Apart from the standard key resources, the business module require the following human resources:

- Experts to do consultancy, data analysis and quantitative research

6.2.5.6. Additional resources for consumers module

Apart from the standard key resources, the consumers module require the following human resources:

- Experts to provide general an personalised food, nutrition and health advices to consumers

6.2.6. Revenue Streams

Revenue streams define the ways that RICHFIELDS generates cash from its customers. In order to be economically sustainable in long-term, RICHFIELDS should generate revenue through different revenue streams. The main revenue streams are:

- Public funding
- Private funding
- Membership fee
- Revenue from services
- Donations by citizens, business organisations, research organisations, etc.

Public funding: Public funding is the funding provided by member states and EU to establish the FNH RICHFIELDS RI. Member states that definitely will finance the RI and the national nodes will be established there are: the Netherlands, Denmark, United Kingdom, Italy, France, and Slovakia. More member states are expected to join to the FNH RI and to have their national nodes. Moreover, it is expected that EU provides funding to FNH RICHFIELDS RI and its national nodes through ESFRI

programme as well. The estimated figures of these funding are reported in D12.2 to of business model assessment.

Private funding: Considering the public-private structure of RICHFIELDS RI, it is expected that a part of funding come from private companies and business entities. The percentage of private funding at the first years would be very small and even negligible while by going forward it is expected that private funds would play a bigger role in financing the RICHFIELDS RI and support its long term sustainability.

Revenue from services: Revenue can also be generated through services that RICHFIELDS offers to its customers. Customers can ask for individual or a package of services and will pay based on the service they request. This includes both members and non-members of RICHFIELDS. Moreover, In case that some customers such as individual researchers or research or business entities do not consider being a member of the RI, they can still ask for access to a specific data set and pay per data. Business entities will also pay per consultancy and data analysis services that they receive.

Membership fee: all the members of the RI should pay an annual membership fee. This membership fee differs based on type of the members. For instance individual researchers would pay a lower amount compared to big research organisations. The membership for SMEs and large companies are different too. For the members who are also data providers to the RI, RICHFIELDS can offer free or discounted membership fee. Members of RICHFIELDS enjoy access to data repository (different levels for different types of memberships). RICHFIELDS offers three types of membership to its customers:

- **Gold membership:** Members can have access to all available data sets and will pay a discounted amount for other services such as training, workshops, conferences, protocols, etc.
- **Silver membership:** Members can have access to some available data sets and should pay for the other data sets and services
- **Bronze membership:** Members can have limited number of access to limited number of data sets and should pay for other services**.**

The defined membership types are the general description to enable us to carry out the assessment in T12.2. The detailed design of membership fee will take place in T12.3 considering more detailed perspective such as:

- Different membership fee for different size of research and business entities
- Different membership fee for research organisations from members states with national nodes which are co-funders of the RI;
- Possibility to give access of the latest (i.e. of the last 3 years) only to Gold members;
- Etc.

In following section we will describe a proposal of membership fee for different customer segments. Policy makers shouldn't pay a fee to access RICHFIELDS RI.

6.2.6.2. Membership fee for researchers

Table1 shows the membership fee for each type of membership and for different types of research entities.

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Table 1. Membership fee for researchers

Type of customer	Bronze member	Silver member	Gold member	Description
Research organisations	1500 €	2500 €	4000 €	Universities, public research entities, private research entities, etc.
Individual researchers	50 €	80 €	150 €	
Students	Free	40	80	

6.2.6.1. Membership fee for businesses

Table 2 shows the membership fee for each type of membership and for different types of business entities.

Table 2. Membership fee for businesses

Type of customer	Bronze member	Silver member	Gold member	Description
SMEs	4000 €	7000 €	10000 €	
Larger companies	20000 €	35000 €	50000 €	Differs based on company's annual turnover, number of employees

6.2.6.3. Membership fee for consumers

Table 3 shows the membership fee for each type of membership and for different types of consumers/citizens.

Table 3. Membership fee for consumers

Type of customer	Silver member	Gold member	Description
Consumers (individuals)	Free	50 €	
Civil society organisations (consumers representatives)	Free	100-150 €	Based on type and size of the entity

6.2.7. Cost Structure

Cost structure refers to all types of costs incurred to operate the business model. The main categories of cost for RICHFIELDS are the followings. These cost categories are common among all the four modules.

- **Data acquisition cost:** Data are considered the main critical raw material for RICHFIELDS. RICHFIELDS can acquire data following different approaches that is described in the section 6.2.4.2 of this deliverable. At the first place RICHFIELDS strategy would be making agreements

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with data suppliers to provide them some services in exchange of data. When this would not be possible and an agreement cannot be reached, RICHFIELDS needs to buy data. Thus, cost of acquisition of data is one of the main costs to be considered.

- **Personnel cost:** Another major cost would be the cost human resource, previously described in section 6.2.5.2. This includes all the key human resources such as IT experts, scientists, data analysts, administration resources, etc.
- **Investment:** As the major significant initial cost, investment is a critical cost for RICHFIELDS. This includes investment required for all the physical resources especially big data infrastructure to set up and establish the RICHFIELDS e-RI.
- **Operating cost:** is the cost related to the day-by-day operation of the RICHFIELDS RI including
    - Location rent
    - Maintenance
    - Upgrade of infrastructure
    - Depreciation
    - Overhead (utilities, travel, etc.)
- **Communication cost:** The partial cost related to all the communication and networking activities happening in RICHFIELDS especially regarding the networking service offerings which is a part of RCHFIELDS value proposition
- **Events organisation cost:** RICHFIELDS needs to organise annual event such as conferences and workshops in the frame of training services it offers to its customers and the cost should be included in the existing cost streams
- **Cost of development and running of RICHFIELDS app:** Development of RICHFIELDS app will be outsourced to an external company that will be also responsible to run and operate the app. The cost will be an initial investment to develop the app and thereafter annual cost to run and operate it.

6.2.8. Governance

RICHFIELDS will be based on a public-private partnership. By public-private partnership we mean forms of co-operation between public authorities and the private sector which aim at ensuring the funding, construction, renovation, management and maintenance of infrastructure associated with the provision of a service. In this regard RICHFIELDS will be funded, established and operated by a mix of both public and private entities.

From a structure point of view, FNH-RICHFIELDS RI is organised with a network architecture of a 'hub and spokes' model in which National nodes play an important role. Member states can set up a national node that brings together relevant public research institutes of food, nutrition and health. These nodes organise the RI facilities in their Member States, put them on the national road map for RI and make them available to others in the European FNH-RICHFIELDS RI. They secure the support of their member state and other donors. National nodes appoint a representative for a yearly General Meeting that selects the board members of the central hub, the Foundation FNH-RI.

Ethical supervision in RICHFIELDS RI is a critical issue which will be investigated in detail in WP13. Considering that RICHFIELDS targets also businesses and companies as direct customers and consequently having direct tangible benefits and value propositions for them, more private companies

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and entities might be interested to join RICHFIELDS. However, it should be noticed that while RICHFIELDS targets to attract private funds as much as possible, the management and operation of the RI would be always shared between public and private sides with a more dominant role of public side in order to ensure supervision on ethics and legal perspectives. Moreover, such a tight ethical and legal supervision seems to be necessary to ensure citizens about the privacy and usage of the data they provide to RICHFIELDS directly.

Details of RICHFIELDS governance model will be investigated and defined in WP13 deliverables.

7 Business model alternatives

In previous chapter, we described the key elements of each building block of business model for each module namely: Researchers module, Policy makers module, Businesses module, and Consumers module. Business model alternatives have been configured by combining different modules, as it has been described in section 5.2 and illustrated in figure 5 of this deliverable. The four generated business model are:

- **Alternative 1 (R+P):** includes researchers and policy makers as the customers of RI. Thus the business model will be formed by including business model elements of Researchers module and Policy makers module;
- **Alternative 2 (R+P+B):** includes researchers, policy makers and businesses as the customers of RI. Thus the business model will be formed by including business model elements of Researchers module and Policy makers module and Businesses modules;
- **Alternative 3 (R+P+C):** includes researchers, policy makers and consumers as the customers of RI. Thus the business model will be formed by including business model elements of Researchers module and Policy makers module and Consumers modules;
- **Alternative 4 (R+P+B+C):** includes researchers, policy makers, businesses consumers all as the customers of RI. Thus the business model will be formed by including all business model elements of Researchers module and Policy makers module, Businesses module and Consumers modules.

The features and characteristics of each alternative will be defined considering the elements of business modules that compose the alternative and have been described in chapter 6. An overview of key elements of building blocks of business model for each business model alternatives is illustrated in figure 11. The vertical column depicts all the defined features of business model modules in chapter 6 of this report and the horizontal row refers to the four business model alternatives illustrated in figure 5. The cross shows that if a key element is included in an alternative.

BM Block	BM elements per block	Alternative 1 (R+P)	Alterantive 2 (R+P+B)	Alternative 3 (R+P+C)	Alternative 4 (R+P+B+C)
Customer segment	Researchers	x	x	x	x
	Policy makers	x	x	x	x
	Businesses		x		x
	Consumers			x	x
Value proposition	Access to high quality harmonised integrated data	x	x	x	x
	Access to research protocols, ontologies, semantic models and vocabulary/thesauri	x	x	x	x
	Training	x	x	x	x
	Access to labs and physical facilities	x	x	x	x
	Networking and community building	x	x	x	x
	Access to documents repository	x	x	x	x
	Access to a performance dashboard	x	x	x	x
	On-demand analysis and recommendations	x	x	x	x
	Definition of new streams of research	x	x	x	x
	Access to aggregated high quality integrated data		x		x
	Linking own data to other data sets		x		x
	Consultancy and data analysis		x		x
	Quality label		x		x
	Corporate social responsibility		x		x
	general and personalised advice on food, nutrition and health aspects			x	x
	Online forum			x	x
	Their impact on citizen science			x	x
Key activities	Identification of data suppliers	x	x	x	x
	Negotiation and data acquisition	x	x	x	x
	Definition of protocols for data collection and data harmonisation	x	x	x	x
	Data quality assessment and data curation	x	x	x	x
	Data harmonisation	x	x	x	x
	Elaboration of thematic/periodic reports	x	x	x	x
	Platform running	x	x	x	x
	Coordination among national nodes and the central hub	x	x	x	x
	Legal and ethical supervision of platform	x	x	x	x
	Customer relationship management	x	x	x	x
	Communication activities	x	x	x	x
	Organising of training services and courses	x	x	x	x
	Consulting on policy recommendations and results of research studies	x	x	x	x
	Performance and Impact analysis	x	x	x	x
	Consulting on quantitative research		x		x
	Data analysis, reports generation and consumer consultancy			x	x

BM Block	BM elements per block	Alternative 1 (R+P)	Alterantive 2 (R+P+B)	Alternative 3 (R+P+C)	Alternative 4 (R+P+B+C)
Key partners	ICT suppliers	x	x	x	x
	Data suppliers	x	x	x	x
Key resources	**Physical resources**				
	Proxy server	x	x	x	x
	Data storage	x	x	x	x
	Cloud big data servers	x	x	x	x
	Server(s) for running the semantic model	x	x	x	x
	Server for running services (analytics)	x	x	x	x
	Human resources				
	ICT Specialists				
	Data project manager	x	x	x	x
	Data scientists	x	x	x	x
	Data modellers/architects	x	x	x	x
	Data engineers	x	x	x	x
	Data integration specialists	x	x	x	x
	Data analysts/statisticians	x	x	x	x
	Team leader	x	x	x	x
	UX (User Experience) designers	x	x	x	x
	Platform/security/JavaScript/Agile/parallel and distributed systems/Big Data/Open Source/system developers	x	x	x	x
	Software engineers	x	x	x	x
	System/network administrators	x	x	x	x
	Client support/helpdesk	x	x	x	x
	Experts (non-ICT) for identification of proper data suppliers and initiate acquisition process	x	x	x	x
	Experts from nutrition and food science	x	x	x	x
	Communication experts	x	x	x	x
	Administrative experts	x	x	x	x
	Legal expert	x	x	x	x
	Regional nodes staff	x	x	x	x
	Experts to do data analysis to provide policy recommendations	x	x	x	x
	Experts to do consultancy, data analysis and quantitative research		x		x
	Experts to provide general an personalised food, nutrition and health advices to consumers			x	x
	Financial resources				
	National funds	x	x	x	x
	EU funds	x	x	x	x
	Private funds	x	x	x	x

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BM Block	BM elements per block	Alternative 1 (R+P)	Alterantive 2 (R+P+B)	Alternative 3 (R+P+C)	Alternative 4 (R+P+B+C)
Revenue streams	Public funding	x	x	x	x
	Private funding	x	x	x	x
	Membership fee	x	x	x	x
	Revenue from services	x	x	x	x
	Donations	x	x	x	x
Cost structure	Data acquisition cost	x	x	x	x
	Personnel cost	x	x	x	x
	Investment	x	x	x	x
	Opearting cost	x	x	x	x
	Communciation cost	x	x	x	x
	Events organisation cost	x	x	x	x
	Cost of development and running of RICHFIELDS app	x	x	x	x

Figure 11. Configuration of business model alternatives and their key elements

8 Conclusions and implications

This report has defined the business model alternatives for RICHFIELDS RI. These business model alternatives have been defined considering the variety of customers that RICHFIELDS would target. In particular the defined alternatives have taken into account businesses and consumers as the direct customers that could be served by RICHFIELDS RI besides researchers and policy makers who have been already considered as the main customers of the most existing RIs in FNH. Thus, inclusion of these businesses and consumers is the innovative part of RICHFIELDS business model which differentiates it from existing RIs. It provides added value to FNH RICHFIELDS RI since it enlarges the partnership of the RI and thus can positively affect the service offerings of RICHFIELDS. However, the challenge has been to define what type of value propositions need to be offered to businesses and consumers and how to set partnership with them and to engage them as data providers of the FNH RICHFIELDS RI. These challenges have been addressed at a general level in this report to provide the required input for further assessment of the alternatives and to clarify the differences between the alternatives. The generated business model alternatives are not meant to be the final business model that will be mentioned in final design, but they will establish the required foundation to define the final detailed business model for the final design. To this end, the generated business model alternatives will be assessed from economic, scientific and societal perspectives in T12.2 to clarify which is the best business model alternative for the final detail design that will take place in T12.3. While the most suitable alternative will be selected, the process of detail design of all the business model elements will take place within T12.3 through considering the defined building blocks of the selected alternative within this report. Meanwhile updated input from other WPs, especially WP13 and WP11 will provide input to define the details of the business model and to establish the links with other WPs. The detailed final design will be the FNH RICHFIELDS RI business model at its maturity level. Meantime, T12.4 will be dedicated to describing the roadmap and steps on how to reach the final business model for maturity level. In the other words, while D12.1 and D12.2 provide the backbone, structure and the main elements of the final mature business model, T12.3 and T12.4 will describe "What" in detail we expect to reach and "How" we plan to reach that.

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Appendix

Appendix 1 – Questionnaire to WP5 and answers

- Please give a summary of the existing tools for consumer generated purchase data (i.e. list of apps in this regard), and if possible highlight the most significant ones
In the first table you can see those apps that we collected in our inventory. Our task can not to be seen as a quantitative study, meaning that the list of collected tools should not be seen as a complete list of all tools available on the market. The task was to describe the range of tools that was of potential interest to the design of the future RI.
I highlighted some (yellow) which I think have many, and interesting features
- What are the data acquisition conditions from the different apps and other tools? *I am not really sure what exact information you are looking for. Please can you give me an example? For most purchase tools no web API was found by searching either on Programmable Web or on Google. But do you want to know which apps that an API was found?*
- What kind of service offerings (if any) are proposed to the customers by these apps? How are they paid by the customers for these service offerings (or is it free?)? *The first table describes the kinds of service offerings and the second table describes kinds of offerings. All apps that we collected are free*
- What type of data do they collect? *The second table describes examples of data that are collected by apps belong to this subcategory.*
Is that enough detailed information for you?
- What type of users (customers) are usually targeted by these apps (other tools)? *I am not really sure what you are looking for. Can you explain - give me an example?*
- What is the terms and conditions of these apps (other tools) to collect purchasing data from users? *The available terms and privacy documents were not presented in a standardised way in either content or vocabulary and were therefore difficult to interpret for non-legal experts. However, we found them to be very different in both length and content. Some described very well what kind of data (personal data) that was collected and how/if that data will be shared with a third partner (affiliated or non-affiliated) etc. When we evaluated each app we had a long list of quality criteria. Have you seen this?*
- Are they usually tools developed by private or public entities (or both)? *Mostly by private entities*
- Have you noticed a common type of a business model among these tools? Has been any significant example with a different business model?
- A summary of identified gaps and needs in terms of purchase data (related to T5.6)

Category	Knowledge & understanding	Planning & organisation	Making a purchase	Financial understanding

Tool name	Sub category	Searching for experiences	Searching for offers	Comparing products & prices	Store/restaurant search/ locator	Creating shopping lists	Booking services	Budgeting	Placing an order	Transactions
AnyList						X				
ASDA			X		X	X			X	
Avocadolist						X		X		
BritishSt.Food		X	X		X					
Checkbook										X
Coeliac UK				X	X					
Costa Coffee Club			X		X				X	
Domino's Pizza			X						X	
EWG's Healthy Living		X		X						
Fat Flush Diet Plan & Meal Tracker Program						X				
Find Me Coffee App		X			X					
Frankie and Benny's			X		X		X			
Frugl			X		X				X	
Goodbudget								X		X
Gousto		X							X	
Grain or No Grain				X						
Groupon			X		X				X	
Harden's Survey Edition		X			X		X			
HelloFresh									X	
IntelliList						X				
JUST EAT		X	X		X				X	

Lidl		X		X	X				
Lloyds Bank Mobile Banking									X
Michelin Restaurants	X			X		X			
Money Manager Pro							X		X
Morrisons Groceries								X	
mySupermarket		X	X		X			X	
Nespresso				X				X	
Ocado	X	X						X	
OnTrees							X		X
OpenTable		X		X		X			
Personal Banking							X		X
PizzaExpress		X		X				X	
Pocket Expense Personal Finance							X		X
Price It					X				
Quick Scan			X	X				X	
Reboot with Joe Juice Diet					X				
Shopmium		X							
ShoppingList 3					X				
SnipSnap Coupon App		X	X						
Spending Tracker							X		
Starbucks		X		X				X	
SurveyMini	X	X							
Tastecard	X	X		X		X			
TellSpec	X		X						

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9
Tesco Groceries		X			X			X	
The Coupons App		X	X	X					
The Monash University Low FODMAP Diet					X				
UK Food Hygiene	X			X					
Untappd - Discover Beer	X			X					
Whole Foods Market		X		X	X				
Vivino Wine Scanner	X		X	X				X	
VoucherCodes.co.uk		X		X					
Yummly Recipes	X				X				

Category: name and description	Sub category: name	Subcategory: function/s	Generated data
Knowledge & Understanding- Refers to the very first and initial phase of the purchase behaviour. The consumer searches for information before starting the next, more organisational step of the purchase planning activities. The information search is likely to include more information about purchase than what ends up in an actual point of sale.	Searching for experiences	Tools showing consumers´ ratings and/or reviews including scores and/or comments about food products and/or restaurant experiences. Some tools provide survey questions after a food purchase or a restaurant visit.	This data is generated by the individual consumer and also available to read by other consumers. Qualitative and quantitative data are generated.
	Searching for offers	Tools with deals, offers, vouchers and/or coupons which can be used in specific stores or restaurants or in stores by own choice.	Intentional purchase data, such as product, price and venue name. Data can also be generated about offers that are frequently searched for during specific times of the year, in different geographical areas etc.
	Comparing products & prices	Tools that provide the consumer with prices and product information from different stores/retails	Intentional purchase information, such as product name and price, product characteristics and venue name (stores and restaurants).

	Store & restaurant search/ locator	Tools with a search function in which the consumer can search for location of specific stores or restaurants via GPS function. Filters can often be used in order to tailor the search for different cuisines or find unique stores with specific products.	Intentional purchase data. Searching for retails and restaurants generate geographic mapping of where or what the consumer are interested to know more about. The data does not say if the information is for own use or someone else´s.
Planning & Organisation Refers to the phase when the plans for a purchase is decided but there is still a need for a bit more planning and organisation before the actual purchase and point of sale is made. The consumer has decided what to have for dinner, what restaurant to visit and/or how much money to spend on a dinner.	Creating shopping lists	Food products/ items can be added on lists by manual input, by voice recording, by adding a photo, by scanning a barcode and/or directly from selected recipes. There are possibilities to comment, send and share lists, make a budget, count calories and estimate prices.	Intentional purchase data. Generated data may vary in level of details, e.g. "milk", "a package of milk" and "a litre of [brand name] milk". For those tools where consumers can use the tools as a budget planner, count calories and estimate prices, intentional data about these aspects are also generated.
	Booking services	Tools for booking a table at a certain restaurant at a specific date and time	Intentional purchase data from a perspective of a potential restaurant visit. Generate the frequency of how often a consumer intends to eat out and plans to visit a specific restaurant or cuisines.
	Budgeting	Tools tracking the consumers' expenses and income. A budget plan can be made. Expense data can be added by transactions, scanned receipts or by manual input. Some tools allow the user to share the budget. Purchases with cash money can either be included (e.g. by manual input or by scanning a receipt) or excluded for some tools	Generated data about consumer buying behaviour, when, where and how much money that is spent during a time period. It also reflects on how much money consumers intend and/or intended to spend on food purchases. From a RICHFIELDS perspective these data shows an intentionally and actual price tag on food purchases both on an individual and sometimes household level. The data can show buying behaviours over time.
Making a purchase-	Placing an order	Tools are often connected to a	Actual point of sale by online shopping or by a physical

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Refers to the actual point of sale. This includes the time where a purchase activity is taking place and the planned decision gets its consequences.		retail/grocery store and allow consumers to directly buy foods from groceries/stores/retails over the Internet. Some tools have functions such as shopping lists, special deals and vouchers to use when ordering. Ordering food online from a restaurant is also included in this group.	place i.e. restaurant/café or retail where you use the tool to spend money and pay your purchase. The generated data is an act and shows the financial effect and what, how much and when it has been purchased. However, the data says nothing about for whom the purchase was made for.
Financial understanding- Refers to the follow-up after the purchase has been made. The amount of money that has been spent is tracked/logged.	Transactions	Tools which collect and show transactions conducted on banking account/s. It differs between the tools regarding the number of banking accounts that can be included. The tools collect transactions which have been conducted with credit and/or debit cards and in some tools the user is able to see how much credit that is used/left on the credit cards.	Generated data about consumer buying behaviour, when, where and how much money that is spent during a time period. From a RICHFIELDS perspective these data can reflect on buying behaviour over time, for instance potential differences between weekdays/weekends. The tools also generate data about where the purchases were made (geographically as well as what venue location).

Appendix 2 – Questionnaire to WP 6 and inputs

- Please give a summary of the existing tools for consumer generated preparation data (i.e. list of apps in this regard), and if possible highlight the most significant ones

>> Please find attached a copy of deliverable 6.1 which outlines the findings of our scoping exercise which aims to identify prototypical apps in the area of food preparation. Fifty apps were identified as representative examples – you can therefore consider all the apps on the list as "the most significant ones". They have also been classified by our typology of food preparation and the table in the report shows which apps relate to which aspect of food preparation behaviour.

• What are the data acquisition conditions from the different apps and other tools?

>> I'm sorry, but I am not sure what you mean by the term "data acquisition conditions". It might be an idea for you to look at the apps in RIMS to see what type of data has been categorised for each app.

• What kind of service offerings (if any) are proposed to the customers by these apps? How are they paid by the customers for these service offerings (or is it free?)?

>> We didn't specifically look at service offerings. In most instances, the 'service' was the application. Some apps had accompanying devises (such as a 'smart kitchen scale'), but in most instances customers were just receiving access to the information provided by the app (in the case of a 'recipe app' – the service provided would be the companies database of recipes that the consumer could access). Many of the apps were free of charge, some were paid for via iTunes or Googleplay. In some cases, there were subscriptions to the service provided by the app or 'in-app add-on' that the consumer could pay for. RIMS has a field detailing whether each app is free or paid for and which apps have additional subscriptions or in-app add ons.

• What type of data do they collect?

>> You can find out this information from RIMS for each app. By far the largest category of data was what I am calling 'free search data'. That is, when a consumer searches a database within an app (for example looking for a recipe in a recipe database), the search term they are entering(e.g., Tomato) is recorded (we assume, but do not know) by the app (or app company) as text data. Consumers could also search for various different things in an app – such as, cooking times and temperatures, cooking instructions/directions, food storage information. The main behaviour was 'obtaining knowledge and information', so much of the data relates to the process of obtaining knowledge. Another category of data was 'favourite or rating' data. This is when a consumer rates an item in an app (e.g., star rating a recipe) or saves an item in an app for future use. Grocery lists/shopping lists were another category of data. There are lists of times entered into an app that the consumer can refer to at a later data.

• What type of users (customers) are usually targeted by these apps (other tools)?

>> I don't think there is a specific demographic beyond people who use smart phones. You could also say people who are interested in food and cooking and the management of personal information (e.g., keeping a shopping/grocery list in your mobile phone)

• What are the terms and conditions of these apps (other tools) to collect preparation data from users?

>> They are specific to each app. However, it should be noted that apps from smaller developers often did not have any T&Cs at all. If an app did have T&Cs, this is recorded in RIMS along with a link to a website where they can be found.

• Are they usually tools developed by private or public entities (or both)?

>> In almost every single case they were developed by a private app developer, or company. There was only one example of an app developed a government department (UK's Department of Health).

• Have you noticed a common type of a business model among these tools? Has been any significant example with a different business model?

>> I have no background in business, so am not the best person to ask - sorry!!! However, as almost all the apps were developed from private app developers or companies, I expect that 'making money by selling the app (and associated in-app purchases)' was the primary motivation. If you want to ask me some more specific questions about the apps, then maybe you could work out what they business model is from that information???

• A summary of identified gaps and needs in terms of preparation data (related to T6.6)

>> We have yet to complete this task. However, may be it is something we could discuss during next week's meeting.

Appendix 3 – Questionnaire to WP 7 and answers

Given the short notice of the current request, combined with the fact that some of the work for deliverables of WP7 are still in progress (7.2, 7.4 and 7.5) the following input should not be considered complete.

1) Please give a summary of the existing tools for consumer generated consumption data (i.e. list of apps in this regard), and if possible highlight the most significant ones

We created an inventory of tools for the collection of consumer generated food consumption data (see deliverable 7.1). A summary or typology of tools in the inventory (purpose and data collection methodologies) can be found in deliverable 7.1 (which has been submitted to RICHFIELDS and also attached to this wp7 input for phase 3). We also created (and submitted to RICHFIELDS) an excel dataset including a list of tools and the data we collected about them (we also attached this dataset). For data management purposes we created an online tool (RICHFIELDS Inventory Management System, RIMS) were the list of tools and the data collected about them can be viewed and investigated. RIMS is accessible at https://inventory.richfields.eu/. For access please contact marcus.maringer@wur.nl. In deliverable 7.3 (which also has been submitted to RICHFIELDS and attached here) we provide a description and motivation for the type of data collected about the tools in the inventory. The main types of data we collected was scientific, legal, or technical in nature.

As to highlighting the most significant tools: In general the most significant tools for collecting in situ food consumption data can be found in the pool of publically available mobile applications (which became our main focus of investigation). In our view the question which of these apps are the most significant depends to a certain extent on the type of research question. In essence, most of the more relevant apps are very similar in terms of their implementation of technology assisted versions of food diaries and their aim at supporting people in changing their eating behavior in one form or another. Hence MyFitnessPal, Lose it!, or Fatsecret might be significant apps for testing weight loss interventions. However, due to confounding situational influences they might be pretty non-significant in terms of assessing habitual eating behavior.

What has become clear though is that the most popular and economically successful apps are those who thrive towards the integration of food consumption, health and other lifestyle data either by offering a multitude of data collection techniques or by accessing data from other "partner" apps. Such enrichment of the collected user generated data not only enhances the user experience but might potentially be a lucrative business for the app vendors (see below). Hence from a perspective of investigating the determinants of eating behavior in its real life behavioral context the "connecting elite" which implement public/private application

programming interfaces (api) for effective and standardized data exchange might be the most significant. This involves apps such as Fitbit, MyFitnessPal, Jawbone UP, iHealth, S Health or Withings' Health mate.

In addition, there is new type of interesting tools providing capacitates for app-app, app-sensor connections. In general, such tools can be classified as data aggregators which provide "one stop connecting models" for food consumption health, and lifestyle data. Examples of such tools are apple's HealthKit, Google Fit, Fitnesssyncer, Human Api, or Validic. There are also projects which provide the standards and technical infrastructures to build data aggregators such as Open mHealth.

This data network will be also discussed in Deliverable 7.4

2) What are the data acquisition conditions from the different apps and other tools?

We are not sure what you actually mean here. Is it about how the tools collect the data? (then see 1), or is it about how RICHFIELDS can acquire that data? If this is about how RICHFIELDS can acquire the data than the results are mixed. One technical opportunity or course is offered via the just described data network's public APIs (see 1). Although this technology will likely become (and in some sectors of mHealth applications already is) a common standard, we found them to be still scarce in the domain of consumer generated food consumption data (ca. 3% of our collected apps implemented a API for data exchange). For the most part data access was absent or insufficiently publically documented. Of the 28% of tools which allowed data access the majority (65%) offered file access (27% pdf and 28% csv). While for the most part we know what type of data the tools work with it remains unclear what type of data is really stored or is accessible (e.g., is the product name, time of consumption or type of support a person received stored and accessible in the data?).

Since app vendors often ask for a license to exploit the user generated data, data might also be directly acquired by the vendors. We did not explore this possibility further.

3) What kind of service offerings (if any) are proposed to the customers by these apps? How are they paid by the customers for these service offerings (or is it free?)?

We did not explicitly investigate the type of services a tool/company provides to their users, however, our impression is that two types of services are relevant: 1) Providing knowledge, training and support: Healthy lifestyle and fitness support (e.g, weight management, fitness and diet planning), medical support (e.g., diabetes, food intolerance, anorexia) and 2) basically what all vendors do, providing and maintaining data collection and visualization infrastructures and technologies. There is also a large groups of tools who are owned and

published by software developers, which often do not offer any services in addition to providing and maintaining the tools and infrastructures for data collection.

4) What type of data do they collect?

   The dataset ScientificDataInputs.xlsx of Deliverable 7.1 and the scientific summaries section of RIMS provides a good overview of the types of data collected by the tools. We will also provide a structured description of these scientifically relevant summaries in Deliverable 7.4, which is still work in progress.

5) What type of users (customers) are usually targeted by these apps (other tools)?

   We did not investigate the specific target groups of the apps explicitly, but from what we can infer based on the propagated purposes of the apps (see 1), the apps are for the most part aimed at people who wants to manage their weight or maintain a healthy diet. But also people who try to stay or become more fit or monitor their training progresses seem to be target users. In essence it seems that the healthy or sportive types as well as the unhealthy and overweight types of people are the main target. These opposing groups might have the highest need for such tools.

6) What are the terms and conditions of these apps (other tools) to collect preparation data from users?

   This will be discussed in Deliverable 7.4 and 7.5 in more detail which is still work in progress. In general, what we see is that users are the owners of the data they collect, but in return for using their services users have to grant the vendor an irrevocable license to exploit the data, including the data integrated from other apps or social networks. Users have to provide personal identifiable information (PID) which is shared with affiliated parties (e.g., with parties on which their services depend) and in most cases consent is asked before data is shared with unaffiliated parties. People might get contacted with service offerings provided by either the vendors or in some cases by third parties.

7) Are they usually tools developed by private or public entities (or both)?

   Although we recorded the names of the application publishers, we did not look into their organizational backgrounds. We believe, however, that the number of publically available tools developed by public or semi-public organizations are almost negligible in our sample.

8) Have you noticed a common type of a business model among these tools? Has been any significant example with a different business model?

   We did not focus on the business models behind the investigated applications. Considering the purposes of the apps it must have something to do with fulfilling people's needs for

behavioral change. We noticed that if users are charged it is usually for, upgrades in app features and services (more data collections, human coaching, recipes, diets and diet plans etc.) or purchases of technologies (e.g., wearables). Another business model might be based on affiliate revenues based on advertising third party products and services. In the terms of use, for instance, it was frequently mentioned that users can opt out of receiving adds via email. Larger companies with several million app users, might also have a lucrative data broker business model based on the user generated data they collect and of which they have the royalty free license to commercially exploit. Delivering targeted advertisements on such large user bases with well-defined health and lifestyle profiles can be a profitable business model.

9) A summary of identified gaps and needs in terms of consumption data (related to T6.6)

This will be discussed in detail in Deliverable 7.5 which is still work in progress.