Exploring Future Opportunities and Barriers for Business Model Concepts in Personalised Nutrition

Bio-Sense

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These insights come from Food4me – "Personalised nutrition, an integrated analysis of opportunities and challenges"

To explore the barriers and opportunities in the scientific, technical, business and consumer aspects of personalised nutrition

To determine whether dietary advice based on a person’s genes, could deliver consumer benefits

To consider what business model concepts for personalised nutrition may emerge in different future scenarios on health and nutrition

FP7 2011-2015 EUR 9 mio Mike Gibney, Dublin

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The sequencing of the human genome in 2002, heralded great expectations for a revolution in health care with the road to personalised medicine clearly seen as an attainable objective.

Within the vision of personalised health care lay the belief that, through nutrigenomics, this concept could readily be extended to personalised nutrition.
Definition of personalised nutrition

The recommendation of a **dietary behaviour** that is appropriate for an individual to maintain optimal health.

It takes into account the individual’s **dietary** and **lifestyle** patterns and preferences, **phenotypic** (biomarker) status and **genetic** background and delivers advice about food choice, eating patterns and lifestyle relevant to nutrition and health.

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**Nutrigenomics**

(University of California, Davis)

The science of how foods affect our genes, how individual genetic differences can affect the way we respond to nutrients and how this gene-nutrition interaction affects diet-related diseases.
The food and health conundrum

The difficulty to get it right

The system underlying dietary behaviour is extremely complex

We have never known more about what food is good for health...

... but having the freedom to make the right choices seems to create problems
Dietary behaviour is a complex system

*From ‘Tackling Obesities’, UK Foresight – 2007*

\[ \text{e.g. the obesity system is all about managing “energy balance” through intake and expenditure} \]
Dietary behaviour is a complex system

Psychological ambivalence

Force of Dietary habits

Level of satiety

Physical activity

From ‘Tackling Obesities’, UK Foresight – 2007
Dietary behaviour is a complex system
A flourishing nutrition and health industry!

... but what is the impact on health?

![Graph showing the rate of overweight from 1970 to 2020 for various countries including USA, England, Spain, Italy, France, and Korea. The graph indicates a significant increase in overweight rates from 25% in the '70s to over 50% today.](https://food4me.org)

From WHO, 2011
The food industry’s very poor perception on health issues

- Unfulfilled promises with regard to products claiming to improve health (health claims, diet & slimming products, functional food)

- Focusing essentially on consuming more, not better: the culture of anything, anytime, anywhere has resulted in the creation of an obesogenic environment

- Incoherent source of food information – conflicting and confusing messages (... also lack of consumer understanding)

- Occasional food scares fuel more doubts about responsibility

Although the food industry is not the only one to blame, it will require long and tedious efforts to regain credibility in food and nutrition issues
Is personalised nutrition a solution to this dietary behaviour dilemma?

... and if so, can food ingredient and food manufacturers use it to their advantage?
Personalised dietary advice: a history

Genetic background data

Metabolic status
(biomarkers: glucose, insulin, vitamin, lipids, hormones,…)

Health status
Food choices
Eating patterns

Risk/benefit analysis
Dietary advice

Nutritionist
Dietician
New forms of PN services (on-line)

Client

Improved personalisation of the advice
Fully personalised nutrition advice

Improved personalisation
The essence of personalised nutrition

*It is NOT about new rules for nutritional advise*

*It is NOT about commercialising nutrigenomics*

*It is NOT about tailoring foods for individual needs*

*It is NOT about turning food into medicine*

*BUT about*

*assisting individuals in achieving*

*a lasting change in dietary behaviour that contributes to health*
It is NOT about new rules for nutritional advice

It is NOT about commercialising nutrigenomics

It is NOT about tailoring foods for individual needs

It is NOT about turning food into medicine

BUT about assisting individuals in achieving a lasting change in dietary behaviour that contributes to health

The essence of personalised nutrition

It is about adjusting nutritional advise by adding nutrigenomics information to offer food choices that fit individual preferences and needs and to coach the adoption of a healthier diet and lifestyle thus

assisting individuals in achieving a lasting change in dietary behaviour that contributes to health
Key to PN = lasting dietary behaviour change!

- Appropriateness of nutritional carrier selection
- Degree of experience of health and well-being
- Degree of acceptance of feedback parameters
- Preparedness to accept nutritional counselling
- Effectiveness of support and coaching
- Acceptance of genetic diagnostic information
- Effectiveness of nutritional advice
- Appropriateness of nutritional advice
- Degree of experience of health and well-being
- Preparedness to accept nutritional counselling
- Effectiveness of support and coaching
- Acceptance of genetic diagnostic information
The personalised nutrition system

Effectiveness of nutritional advice

Appropriateness of nutritional carrier selection

Degree of experience of health and well-being

Degree of acceptance of feedback parameters

Preparedness to accept nutritional counselling

Effectiveness of support and coaching
The personalised nutrition system

The map shows the driving forces and their connections relevant to personalised nutrition offerings. It provides an overview of the environment in which PNOs are embedded and how its elements are influencing each other positively or negatively.

Driving Force = Variable High or low

Prevalence of lifestyle related diseases

Arrows = Direction of Influence+ or –

Financial pressure on health care systems
The personalised nutrition system: 8 pivoting variables

These key factors influence the core mechanism of any personalised nutrition offering and are critical success factors for any business model aimed at a lasting change in dietary behaviour.

- Reliability of risk/need profile assessment
- Acceptance of genetic diagnostic information
- Force of dietary habits
- Ability of food producers to individualise food offerings
- Effectiveness of nutritional advice
- Financial pressure on health care systems
- Effectiveness of economic feedback signal
- Psychological ambivalence

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7 key issues for PN as seen by stakeholders

*(based on interviews with industrial and societal stakeholders)*

- Doubt about the strength of the **scientific evidence**
- Feasibility, reliability and affordability of the **diagnostics**
- Realistic focus is on **metabolic groups**, rather than individuals
- Access to nutritional advise must be made **simpler** and fit to **personal lifestyle**
- **No special foods** needed (too difficult, too expensive)
- **Economic feed-back signals** needed > strongest motivators
- Focus on **achieving lasting change in dietary behaviour**, NOT on improving nutritional advise or quality of food
Current PN offerings are limited

Small to medium, independent operators – no “chains”
TECHNOLOGY/INTERNET ORIENTED
Scope restricted to selling of specific devices and apps for measuring food intake, physical activity, meal planning, recipes, shopping, etc…

SIMPLE
INPUT: Self reported parameters and dietary intake data
OUTPUT: personal diet plans & general lifestyle advice

FEW INTEGRATE diagnostics (phenotype, genotype) with advice
SCIENTIFIC BASIS for advice is UNCLEAR
CHEAP: 75% are < EUR 100
How do consumers perceive Personalised Nutrition?

- Focus group analysis: 16 groups (124 pers.) in 8 countries, testing these 9 archetypes
Consumer views (focus groups)

Essential attributes

- Regular support & guidance
- Qualified expert advice
- Exercise & lifestyle
- Personal contact

Attributes to differentiate

- Group support ↔ one-to-one guidance
  groups may motivate to adhere to advice
- Dietary intake data ↔ phenotypic data ↔
genotypic data
  dietary intake data often seen as too simple
  phenotypic data is most familiar
  genotypic data is often a step too far
- Scientific evidence ↔ alternative evidence
  there is a niche favoring experience-based evidence
- Individual payment ↔ sponsored program
  government or employer sponsored programs
  are viable option for some
- Personal food preferences ↔ radical change in dietary patterns
  dietary advice based on personal food preferences is easier to comply to, but for some it is too much in conflict with health needs
### 6 key attributes to differentiate personalized nutrition archetypes

<table>
<thead>
<tr>
<th>Type of organiser</th>
<th>Type of interface used</th>
<th>Nature of feedback</th>
<th>Evolution tracking</th>
<th>Frequency of feedback</th>
<th>Type of data gathered</th>
</tr>
</thead>
<tbody>
<tr>
<td>business</td>
<td>internet</td>
<td>health status, food &amp; diet plan</td>
<td>none</td>
<td>one-off</td>
<td>self reported + BMI phenotyping genotyping</td>
</tr>
<tr>
<td>corporate</td>
<td>email</td>
<td>activity profile</td>
<td>limited</td>
<td>self-requested</td>
<td>+ BMI phenotyping</td>
</tr>
<tr>
<td>government</td>
<td>telephone</td>
<td>lifestyle</td>
<td>rigorous</td>
<td>organised monitoring</td>
<td>genotyping</td>
</tr>
<tr>
<td>NGO</td>
<td>face to face</td>
<td></td>
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</table>
Collect all the necessary personal information

Establish the risk/benefit profile – generate nutrition and lifestyle advise

Personal interface – deliver advise and give feedback on progress

Tools to support execution of the advise
Full PN service = constellation of activities

Information collection

Establish the risk/benefit profile
- generate nutrition and lifestyle advise

Personal interface
- deliver advise and give feedback on progress

Tools to support execution of the advise

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Full PN service = constellation of activities

Information collection

- biological status
- quantified self
- lifestyle/food, habits & preferences
- questionnaires
- sampling
- analytics

Establish the risk/benefit profile - generate nutrition and lifestyle advise

Personal interface - deliver advise and give feedback on progress

Tools to support execution of the advise

Helps to build better metabolic group profiles

Helps to build better algorithms
Full PN service = constellation of activities

Information collection
- biological status
- quantified self
- sampling
- analytics

Risk/benefit
- lifestyle/food, habits & preferences

Advice generation
- monitoring tools
- scientific algorithms
- databases

Personal interface
- deliver advise and give feedback on progress

Tools to support execution of the advise

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Full PN service = constellation of activities

Information collection
- biological status
- lifestyle/food, habits & preferences
- quantified self
- questionnaires
- analytics

Risk/benefit - Advice generation
- monitoring tools
- databases

Delivery feedback interface
- mobile tools
- personal contact

Tools to support execution of the advise
- Helps statistics on food consumption
- Contributes to monitoring
PN = integrating several business activities

- Individual clients (consumers, patients, employees)
  - Medical profession
  - Dieticians/nutritionists
  - Wellness/Fitness centres
  - Employers
  - Public health care
  - Insurance
  - Hospitals
  - Day-care
  - Schools
  - Retailers

- PN service integrators
  - Analytical laboratories
  - Diagnostics industry
  - Database service providers
  - Knowledge rule developers
  - Medical appliance industry
  - App interface providers
  - Household appliance industry
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QuaLiFY Objective

Construct an ‘open innovation business model’ for SME commercialisation (WP4)
Personalisation – how individual?

- Scientific understanding points to a clustered dietary advice concept

Population dietary advice

Gene based individual dietary advice

Clustered dietary advice (metabolic group level)
Personalisation: how individual?

For nutritional/health advice: metabolic group level

... but for food choice and lifestyle advice and the way the PN service is organised the advice is entirely individual
3 Levels of personalisation

**Personalised nutrition**
- Interface, tools, feedback preferences, psycho-social factors

**Individual recommendation for dietary behaviour**
- Dietary intake
- Food preferences
- Lifestyle preferences

**Basic personal nutritional recommendations**
- Phenotyping (physical parameters and biomarkers)
- Genotyping (SNP profile)

- Optimal nutrient requirements

**Biomarkers<>Nutrient<>Genotype interactions**

- **metabolic group level**
- **individual level**

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What is driving this interest in personalised nutrition?
Gene-based science and technology

The human genome analysis has allowed us to understand gene-nutrition relationships (nutrigenomics) and to better interpret biomarker-nutrition relationships.

Knowing the genetic make-up of an individual provides us with new capabilities to understand how food and dietary behaviour influences individual health and to assess individual risk for disease.
Health costs – a huge societal burden

Largely due to obesity and chronic diseases, which are essentially a consequence of inappropriate food habits and lifestyles

Important changes to the health care systems are expected for societies to cope with the rising costs

However the locus of control of health is the individual, raising issues of social responsibility in maintaining individual health

Can people be convinced to become more socially responsible?

A need
A desire

Individualism and freedom of choice

...requires significant empowerment of individuals to be able to make informed and responsible choices

... which is very difficult in complex and very emotional issues like food and health due to the difficulty to access and understand the knowledge

Can society organise health care with respect for individual choices? unless enabling tools become available, appropriate and user-friendly
Personalised nutrition is an opportunity at the confluence of these 3 major trends.
Personalised nutrition – the future

Broad acceptance of personalised nutrition is likely to require significant changes in the societal context (scenarios)

If so, the following is bound to happen:

- **Blurring borders** between nutrition/diet and health care
- **Community based** - slow but more profound development
- **Education** - and child-focus will be high
- Personal **health data = value asset** (health bank)
- New habits: **self quantification** (monitoring and feedback)
- Dietary behaviour change makes **special foods obsolete** (except for people with metabolic disorders)
- Health **counselling ubiquitous** and via on-line interface
- Emerging **uniform data** platform and interpretation (diet/nutrition/health algorithm)
My experience in Food4me exploring personalised nutrition

Understanding that the PN system is much more than dietary advice

Surprisingly positive consumer response to PN

Business models and their potential for societal change in future scenarios

29 years experience working in and with the food and food ingredient industry

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