

Innovation in personalised Nutrition through Cluster cooperation in the Silver economy

Deliverable 1.5

a) Report on Collective Intelligence Design Sessions

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Abstract:	This document presents the results of the first INCluSilver Collective Intelligence (CI) Session. The aim of this workshop was to harness the expertise of the INCluSilver Panel of Experts to inform future project activities. Specifically, the panel of experts addressed the following tasks: (a) identify challenges to the design of effective and efficient Personalised Nutrition services for older adults, (b) identify barriers which SMEs face in working to innovate in this context, (c) identify competencies needed by SMEs for successful innovation in this context, and (d) identify criteria which can be used to assess these competencies.
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List of Abbreviations

<i>Abbreviation</i>	<i>Description</i>
CI	Collective Intelligence
PN	Personalised Nutrition



Executive Summary

This document presents the results of the first INCluSilver Collective Intelligence (CI) Session, which was held in Galway, Ireland on May 25th-26th, 2017. This CI session was attended by the INCluSilver Panel of Experts (PoE), serving as the first meeting of this panel, which is made up of eighteen experts from academia, research, and industry, as well as healthcare professionals.

The aim of this workshop was to harness the considerable and varied expertise of the PoE members to inform future activities on the INCluSilver project. More specifically, the experts in the room were tasked with the following: (a) identify challenges to the design of effective and efficient Personalised Nutrition (PN) services for older adults, (b) identify barriers which SMEs face in working to innovate in this context, (c) identify competencies needed by SMEs for successful innovation in this context, and (d) identify criteria which can be used to assess these competencies.

Given the importance of these four tasks for the design of future INCluSilver activities, and the considerable cognitive demands placed on PoE members in addressing each of these tasks over two days, a carefully structured workshop was designed by the facilitation team from NUI, Galway. The workshop involved the application of series of Collective Intelligence methods to guide the PoE members through multiple rounds of idea generation, clarification, and discussion.

Over the course of the two-day workshop, experts were facilitated in the use of the ideawriting technique to generate a comprehensive set of challenges to the design of effective and efficient personalised nutrition services for older adults, and, following a series of fruitful rounds of discussion, a set of targeted options for overcoming some of the most critical of these challenges was generated. Similarly, experts generated a considerable set of barriers faced by SMEs seeking to innovate in this context, and a corresponding set of well-reasoned options for overcoming these barriers. During the latter stages of the workshop, participants were facilitated in engaging in scenario based design, at which stage they generated a set of concrete and specific competencies which are necessary for successful innovation of PN solutions for older adults. Finally, building upon these competencies, experts generated a set of suggested criteria which may be used to evaluate proposal from SMEs applying to the innovation voucher scheme.

This report represents a compilation of all of the above input from experts during the CI session, and will serve as a useful and informative guide for future INCluSilver research and design activities.



1 Introduction

1.1 Scope

This deliverable details the process and results of the first INCluSilver Collective Intelligence session, conducted on May 25th and 26th, 2017. This session served as the first meeting of the INCluSilver Panel of Experts (PoE), bringing together experts from academia, research, and industry, as well as healthcare professionals.

The aim of this workshop was to harness the expertise of the PoE members to gain insights into (a) challenges to the design of effective and efficient Personalised Nutrition services for older adults, (b) barriers which SMEs face in working to innovate in this context, (c) competencies needed by SMEs for successful innovation in this context, and (d) criteria which can be used to assess these competencies. To achieve these aims, a facilitation team from NUI, Galway, employed Collective Intelligence methods to guide the PoE members through multiple rounds of idea generation, clarification, and discussion.

The results of this CI session represent an important contribution to WP1, which sets out the INCluSilver Market Intelligence and Strategy Setting. Together with D1.3, which involves the use of survey methods to analyse stakeholders considerations, criteria, barriers and facilitators to the design of market- led solutions for PN for older adults, and D1.6 which provides further exploration of the competencies needed for the successful development of PN for older adults, as well as barriers to be overcome, and options to do so. Together, these three deliverables will provide a comprehensive market intelligence analysis which will contribute to the design of the Collaborative Virtual Environment in WP2, the Innovation Voucher Scheme in WP3 and the Innovation Support Services in WP4.

1.2 Audience

- European Commission
- All INCluSilver partners

1.3 Structure

The main body of this deliverable is divided into two main sections:

Section 2 provides an overview of the workshop methodology.

Section 3 provides the results from each stage of the CI process.



2 Workshop Methodology

This workshop was based on the Collective Intelligence (CI) methodology, which has been used in a number of recent H2020 projects to facilitate project design work (cf. Hogan, Ojo, Harney, Ruijer, Meijer, Andriessen et al., 2017). The CI methodology is comprised of a number of components, including idea-generation, categorisation, and, in the context of INCluSilver, the generation of specific competencies and criteria using scenario-based user stories.

Based on Warfield's (1994) science of generic design, the CI process is a system of facilitation and problem solving that helps groups to develop outcomes that integrate contributions from individuals with diverse views, backgrounds, and perspectives. Established as a formal system of facilitation in 1980 after a developmental phase that started in 1974, IM was designed to assist groups in dealing with complex issues (see Ackoff, 1981; Argyris, 1982; Cleveland, 1973; Deal & Kennedy, 1982; Kemeny, 1980; Rittel & Webber, 1974; Simon, 1960). The theoretical constructs that inform CI, developed over the course of more than 2 decades of practice, draw from both behavioral and cognitive sciences, with a strong basis in general systems thinking.

The CI approach carefully delineates content and process roles, assigning to experts responsibility for contributing ideas and to the facilitator responsibility for choosing and implementing selected methodologies for generating, clarifying, structuring, interpreting, and amending ideas. Emphasis is given to balancing behavioural and technical demands of group work (Broome & Chen, 1992) while honoring design laws concerning variety, parsimony, and saliency (Ashby, 1958; Boulding, 1966; Miller, 1956). CI has been applied in a variety of situations to accomplish many different goals, including assisting city councils in making budget cuts (Coke & Moore, 1981), developing instructional units (Sato, 1979), designing a national agenda for pediatric nursing (Feeg, 1988), creating computer-based information systems for organizations (Keever, 1989), improving the U.S. Department of Defense's acquisition process (Alberts, 1992), promoting world peace (Christakis, 1987), improving Tribal governance process in Native American communities (Broome, 1995a, 1995b; Broome & Christakis, 1988; Broome & Cromer, 1991), and training facilitators (Broome & Fulbright, 1995). More recently, CI has been applied to the development of a national well-being index (Hogan, Johnston, Broome, McMoreland, Walsh, Smale, et al, 2015), marine sustainability societal mobilization (Domegan, McHugh, Devaney, Duane, Hogan, Broome et al., 2016), and mapping entrepreneurial competencies (RezaeiZadeh, Hogan, O'Reilly, Cunningham, & Murphy, 2017).

An overview of the phases of the 2-day collective intelligence session is provided in Figure 1 below, along with a breakdown of the CI workshop agenda. Details in relation to the PoE members in attendance at the CI session can be found in D1.2.



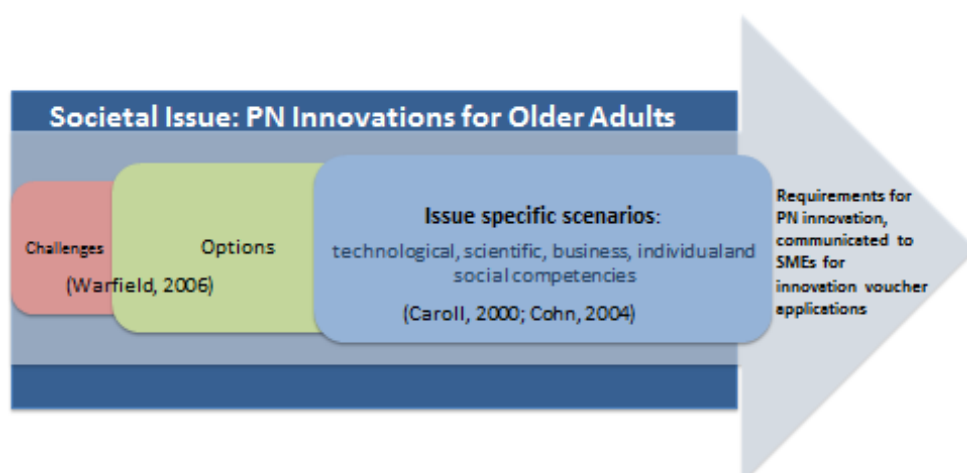


Figure 1. Collective Intelligence Scenario-based Design (Hogan et al., 2017)

Table 1. Collective Intelligence Workshop Agenda

Day 1
<p>Phase 1: Challenges to the design of PN services</p> <p>09:15 – 9:45 – Opening remarks and introduction to the process</p> <p>9:45 - 12:00 – Challenges to the design of effective Personalised Nutrition services: Review, clarification, additional ideas, identifying most significant challenges</p> <p>12:00 – 13:00 – Idea generation – Options for overcoming challenges of design 1</p> <p>Phase 2: Options in response to challenges</p> <p>14:00 – 15:00 – Idea generation – Options for overcoming challenges of design 1 (cont’d)</p> <p>15:00 – 17:00 – Idea generation – Options for overcoming challenges of design 2</p> <p>17:00 – 17:15 – Wrap-up</p>
Day 2
<p>Phase 3: Barriers to innovation and options in response</p> <p>09:15 – 09:30 – Recap of Day 1</p> <p>09:30 – 11:00 – Idea generation: Review of barriers to innovation and generation of options to overcome them</p> <p>Phase 4: Competencies needs for effective innovation</p> <p>11:20 – 13:00 – Scenario-based design – competencies needed for effective innovation</p> <p>14:00 – 15:00 – Further discussion of competencies needed for effective innovation</p> <p>Phase 5: Criteria for evaluating competencies</p> <p>15:00 – 17:15 Criteria for evaluating competencies and funding SMEs in the voucher scheme</p>



The first stage of the CI process involved experts generating a set of challenges in response to the trigger question: “What are challenges to the design of effective and efficient Personalised Nutrition services for older adults?” Experts had been contacted in advance of the session by email, with a request to respond to the above question. By email submission, the Panels of Experts (PoE) identified 172 challenges, which were arranged into seven categories by the facilitation team and posted on display walls when experts entered the room for the beginning of the workshop. Their first task, after the introductory presentation about the workshop and broader INCLuSilver goals, was to (a) review the challenges so that each member of the panel of experts had a clear understanding of the scope and breadth of challenges to designing effective PN services, and (b) come to a consensus on a set of most critical challenges within each category. Given the extensive set of challenges, the PoE members were divided in four groups for the task of reviewing challenges, with each group assigned to two distinct categories for review, discussion, and clarification of key issues of consensus in presenting to the full group.

Next, experts engaged in a process of generating options for overcoming the challenges identified in each category. The ideawriting technique (Warfield, 1994) was used during this phase, and during each phase of option generation throughout the workshop. The ideawriting technique involves five steps: (a) presentation of a stimulus question to experts; (b) silent generation of ideas in writing by each participant working alone; (c) exchange of written sheets of ideas among all group members, with opportunity for individuals to add ideas as they read others’ papers; (d) discussion and clarification of unique ideas; and (e) an oral report of the ideas generated by each working group.

The third stage of the workshop involved experts generating a set of barriers in response to the trigger question “What are barriers that SMEs face when working to create effective and efficient Personalised Nutrition innovations that will optimise the health and wellbeing of older adults?”. Again, experts had been contacted in advance of the session by email, with a request to respond to the above question. By email submission, the panels of experts identified 45 barriers, which were arranged into four categories. At this stage, each group was assigned a separate category of barriers to (a) review, (b) identify a set of critical barriers, and (c) develop a set of options in response to the most critical barriers, using the ideawriting technique.

Once each group had developed, discussed, and presented on, a set of options for overcoming barriers, the workshop advanced to the fourth, and penultimate, stage which involved experts developing a set of core competencies which SMEs and their co-creation team would need to overcome both the design challenges, and the barriers to innovation, in order to produce effective and efficient Personalised Nutrition products or services for older adults. To facilitate the development of these competencies, experts were guided through a scenario-based design process. This involved the use of four carefully designed scenarios, which described hypothetical innovation contexts including key stakeholder such as SMEs, researchers, health care professionals, end users, and industries (see Section 3.3). Again, the ideawriting technique was used at this stage, specifically, to highlight specific competencies that actors in the co-creation scenario would need in order to design effective and efficient PN services or products for older adults.



The final stage of the workshop built upon the previous competency identification stage by requiring experts to generate a set of criteria which may be used to evaluate the innovation competencies developed in stage four. During this stage, experts were given the opportunity to circulate the room, reviewing all key challenge and barriers which had been posted on the wall, and worked with their group to generate criteria in light of the competencies discussed at the previous stage.

Once all of these steps had been completed, the session closed with a short discussion of progress made during the two days, and consideration of next steps.



3 Workshop Results

3.1 Challenges to the design of effective and efficient Personalised Nutrition Services

Experts identified a total of 172 challenges to the design of effective and efficient Personalised Nutrition services for older adults, across 7 categories. These categories are as follows: A) Policy and Health Care Systems, B) Logistic, Design and Packaging Solutions, C) Diet and Food Production, D) Determinants of Diet and Physical Activity, E) Functional Food and Nutrigenomics, F) e-Health, and G) Information and Social Networking. The section below provides an example of challenges generated by experts in each of these categories. The full set of categorised challenges is provided in Appendix A.

3.1.1 Policy and Health Care Systems

Experts generated a total of 25 design challenges which related to Policy and Health Care Systems. This category of challenges is comprised of issues relating to funding systems for research and interventions in healthcare, policies and priorities within healthcare systems, and barriers to obtaining, using, and relaying critical nutritional information to older adults. The following are a sample of challenges which, following review, experts focused on for the generation of options to overcome challenges in this category.

Table 2. Policy and Health Care Systems: Challenges and options

Challenge	Option(s)
Lack of legal, ethical and societal framework to ensure genetic information about food and disease is appropriately handled	Facilitate data collection and learning as well as making it part of Personalised Nutrition solutions in a safe (in terms of privacy) way
Economic interests blur health nutrition facts	Demand that EU wide companies add traffic light QR codes on products as a nutritional summary
Lack of objective clinical trials evidence for long term benefits	Encourage (make funding available for) diets and health interventions supporting Personalised Nutrition Promote public intervention research with private funding
Lack of money and limited financing of preventive actions / nutritional care	Set a minimum limit for prevention resources in the national budget (as a percentage of GDP)
Lack of training of health professionals on the importance of nutrition, the means of implementation, and on practical applications of PN	Make Nutrition courses compulsory for every health professional Develop systems to award positive behaviour change training



Lack of understanding of the clinical condition to be considered in the application of PN	Make known (through flyers or other infographics) the links between specific senior health conditions and associated nutritional deficiencies
Life style interventions are hardly accepted as Health Care efforts	Require lifestyle interventions as prerequisites of more expensive service financing
The challenge of contradicting accepted beliefs and overly theoretical or fake scientific information related to elderly persons	Identify false information and share the fact that it is false, efficiently with relevant target audiences
Limited budget for meals in nursing homes, which also needs to cover costs for nutritional supplements	Develop information packs and/or dissemination materials on nutritionally beneficial yet moderately priced options
Lack of central system that covers information on health, nutritional needs & dietary preferences	Promote scientific statements from scientific societies with advice to SMEs

3.1.2 Logistic, Design, and Packaging Solutions

Experts generated a total of 26 challenges in this category. This category is comprised of issues relating to the design of packaging solutions which will provide a more user-friendly experience for older adults, as well as critical issues around delivery and distribution. The following are a sample of challenges which, following review, experts focused on for the generation of options to overcome challenges in this category.

Table 3. Logistic, Design, and Packaging Solutions: Challenges and options

Challenge	Option(s)
The need for food packaging to take into account the difficulties experienced by elderly people	Promote design input using subsidies
The challenge of designing a packaging device that reads QR barcode with ingredients served and senses patient-user ID	Standardisation or group adoption of codes
The challenge of designing easier to open packaging	Encourage innovation in packaging integrated with QR coding
The challenge of integrating sensor technology in packaging to highlight food issues (e.g. out of date product)	Encourage innovation in shelf-life extension and adoption of Internet of Things or sensor monitoring – Make this a priority for funding
The challenge of highlighting the nutritional	Establish the use of standard messages



benefits of products for the elderly on packaging	delivered by a government agency
The challenge of designing distribution systems to make access easier to old people	Create business models to facilitate distribution to elderly recipients
For elderly the geographical distance determines in many cases access to services, so they take the nearest, but not the most appropriate products	Organise a delivery chain similar to the delivery chain for medicines to reduce costs
The challenge to engage older adults in their meal, even if they can't prepare it themselves any more, to increase self-esteem and individualize their meals according to their preferences	Design apps for elderly to order their food, taking their preferences/needs into consideration

3.1.3 Diet and Food Production

Experts generated 28 challenges in the Diet and Food Production category. This category is comprised of issues relation to the various factors which must be addressed in order to in the provide food products which cater to the needs of older adults. These include challenges of: cost, research, expertise, and dissemination of information, among others. The following are a sample of challenges which, following review, experts focused on for the generation of options to overcome challenges in this category.

Table 4. Diet and Food Production: Challenges and options

Challenge	Option(s)
The need to provide the food industry with more knowledge of the effects of food on health	<p>Create attractive opportunities for collaboration between industry and universities (knowledge-transfer)</p> <p>Provide scientifically based guidelines for SMEs on nutritional needs of the elderly</p>
The challenge of aligning recommendations/expectations with realistic product opportunities for industry	<p>Ensure that there is awareness that an innovation can only become a success if it is palatable and acceptable by the consumer</p> <p>Promote 'slow implementation' to overcome old habits. Innovations should seek to slowly work to change old habits rather than drastically change traditions or behaviours which have long existed for the older adults</p>
The challenge of promoting responsible, knowledge-based food production practices based on scientific evidence	<p>Create opportunities for industry-university collaboration</p> <p>Promote evaluation by independent</p>



	authorities
Designing products specifically tailored to the elderly	Promote 'food design' specific to the elderly – e.g. with fortification Design innovation user interfaces (e.g. voice command, rather than buttons) and implement automated feedback from users
Only multination companies are able to determine the nutrient content of their product, but the generated information is hardly accessible in public databases	Increase awareness of the ability to access publically available nutritional databases like USDA for appropriate nutritional data
National Health Services should create a pathway to facilitate the correct use of food (e.g., via diet experts)	Encourage cross NHS food-industry collaboration aimed at highlighting needs, and maintaining health and wealth. The state has lots of data at the population level which can be used for research Create stakeholder mapping and set up advisory panels for SMEs to include consumers, providing them with an opportunity to advise SMEs of unmet needs or validate current propositions

3.1.4 Determinants of Diet and Physical Activity

Participants generated 22 challenges in the Determinants of Diet and Physical Activity category. This category is comprised of issues relating to the range of factors which are implicated in our ability to change dietary habits, and levels of physical activity. Such factors addressed by experts include: the integration of quality food into older adults lifestyle, catering for those with mobility issues, education and awareness and understanding food choices, among others. The following are a sample of challenges which, following review, experts focused on for the generation of options to overcome challenges in this category.

Table 5. Determinants of Diet and Physical Activity: Challenges and options

Challenge	Option(s)
The challenge of understanding how quantity and quality of food can be integrated into a healthy lifestyle including exercise, stress reduction activities, and controlled use of alcohol, etc.	Incentivise prevention rather than treatment, through government funding
The challenge of supporting	Develop initiatives in the three clusters of elderly



education/awareness regarding importance of good nutrition for healthy active aging	(go-go, slow-go, no-go) focusing on activities related to a correct diet for their respective needs
The challenge of understanding factors governing food choice in the elderly	Establish a list of existing databases from EU Projects (e.g. Food4Me, Helena) which SMEs might use to better understand the drivers of food choice to tailor food solutions via Personalised Nutrition
The challenge of disseminating public health messages on the links between nutrition and active healthy aging	Promote consumer science studies in older adults to understand food choice behaviour and apply learning in effective products
The challenge of creating palatable, easy to eat, healthy, cheap foods that make them the first choice for consumers	Establish incentives for SMEs to invest in research and development in this area
Insufficient willingness to change lifestyle	Identify the different target groups and embed behavioural science into interventions, For example, some groups may be more open to change, whereas others may be more set in their habits
The challenge of promoting institutional involvement in awareness campaigns	Encourage institutional awareness programmes with key messages at country and EU levels
The challenge of too many gadgets but lack of social action for effective dietary and physical activities	Establish possibilities for older adults to communicate and work together on a healthier diet and level of physical activity, allowing them to interact with others who are working on a similar programme or are in the same situation
The challenge to combine nutritional and physical interventions to maximize impact	Encourage integrated IT solutions for diet and physical activity in Personalised Nutrition

3.1.5 Functional Food and Nutrigenomics

Experts generated 25 challenges in this category. These challenges addressed issues relating to functional food and nutrigenomics. Experts highlighted the need for an advance in research and scientific understanding in this area, while also noting resource issues including, for example, the amount of time and money needed to perform research of the standard required. The following are a sample of challenges which, following review, experts focused on for the generation of options to overcome challenges in this category.



Table 6. Functional Food and Nutrigenomics: Challenges and options

Challenge	Option
Time taken for studies and research versus industrial timescales in turnover of products, longevity of SMEs, and overall cost	Highlight the opportunity to take market share from the supplement market Create a functional food market. Change consumer awareness of functional foods.
Evaluation of the link between different polymorphisms in response to specific diet	Establish links between different organisations to make linkage between phenotype and response/needs possible
Most functional foods actually lack usefulness and are publicity products	Have a national professional organisation assess new functional food products
Lack of methodologies for phenotyping (determination of individual needs)	Establish individual needs and responses to functional foods and bioactive substances
Although we have a good understanding of the biology of diseases from diabetes to osteoporosis to heart disease, etc., less well understood, but of central importance, is human behaviour in respect of food choices	Try to make the consumer aware of functional foods as an alternative to food supplements (to create a functional food market) Create awareness of customers towards functional foods
The challenge of a too strong financial influence over science. It is very expensive to research and even more expensive to validate Nutrigenomics	Publish survey results and best practice for user involvement

3.1.6 e-Health

Experts generated 22 challenges in the e-Health category. This category comprised of issues relating to the design and delivery of e-Health solutions for Personalised Nutrition. These issues included, for example, providing adequate monitoring capabilities and addressing user-friendliness for those without digital skills. The following are a sample of challenges which, following review, experts focused on for the generation of options to overcome challenges in this category.

Table 7. e-Health: Challenges and options

Challenge	Option(s)
The challenge of digital exclusion and promoting ways to support populations who do not have digital skills	Establish digital skills programmes for older adults
Provide scientifically validated information	Develop a shortlist of validated e-health tools or apps to be promoted by doctors,



through labeled websites	which are supported by health authorities
Integrating e-health services into the chronic care model	Ensure collaboration between public health and innovators
The risk not to obtain correct/up to date information from users of e-health applications, which may negatively affect the service provided	Promote a unique database that can link all healthcare operators (GP, Hospital, NHS) and relevant information

3.1.7 Information and Social Networking

Experts generated 24 challenges in the Information and Social Networking category. This category comprised of issues relating to the provision of scientifically validated nutritional information to older adults, including the problem of the prevalence of false information about nutrition, and the need to consider various forms of media in disseminating information to older adults. The following are a sample of challenges which, following review, experts focused on for the generation of options to overcome challenges in this category.

Table 8. Information and Social Networking: Challenges and options

Challenge	Option(s)
The challenge of guiding health professionals in defining the key messages appropriate to facilitate the behavioural change required	Design e-learning courses for professionals
Dissemination of key messages not only via health professionals but through other outlets	Encourage unusual but effective routes to consumers (example of milk cartons used for missing persons)
Lack of understanding that severe nudging can lead to negative results -> to achieve success the older adult has to feel that he/she has an actual choice / is the decision maker	Mass media messages showing "good" examples
The challenge of influencing the social peer network of elderly people to provide appropriate messages to facilitate the behavioural change required	Use radio and TV programmes to disseminate good information
The challenge to reach those, who need nutritional support most, e.g. the less well educated or lonely older adults	Develop a multi-channel networks dissemination plan (online/offline) to share experiences of "what works"



3.2 Barriers to innovation for SMEs and other key stakeholders

Experts generated a total of 48 barrier which SMES and other key stakeholders face in the context of innovation of Personalised Nutrition products or services for older adults. These barriers were divided into four categories: User Needs and Characteristics; Resources and Regulations; Research, Evidence and Methods; and Business-related barriers. The section below provides an example of barriers generated by experts in each of these categories. The full set of categorised challenges is provided in Appendix B.

3.2.1 User Needs and Characteristics

Experts generated 12 barriers in the User Needs and Characteristic category. This category included a variety of factors which may impact on users' willingness or ability to engage with Personalised Nutrition products or services, including, for example, lack of knowledge of user's specific needs, lack of trust on behalf of the users regarding data privacy, and lack of motivation on behalf of older adults. The following are a sample of barriers which, following review, experts focused on for the generation of options to overcome barriers in this category.

Table 9. User Needs and Characteristics: Barriers and options

Barrier	Option(s)
Affordability - making the right choice for people the affordable choice	Engage with older adults to determine their specific needs Establish knowledge on cheaper alternative food choice solutions
Trust may be a barrier: trust in the provider and trust in the security of the data	Ensure clarity and transparency in the information provided on data security
Lack of motivation on the part of older adults will be the barrier for SMEs	Address this through an "Old Habits Die Hard" public health campaign
Inadequate IT solutions for older adults - they have rather specific needs with respect to GUI etc. which are often overlooked	Ensure the capability for consumer testing during the innovation development phase

3.2.2 Resource and Regulations

Experts generated 9 barriers in the Resources and Regulations category. This category included issues relating to both the regulations which SMEs must be aware of, and adhere to, in innovating in the context of Personalised Nutrition, and common resource issues for SMEs seeking to develop new products in this space. The following are a sample of barriers which, following review, experts focused on for the generation of options to overcome barriers in this category.



Table 10. Resource and Regulations: Barriers and options

Barrier	Option(s)
Cost of developing evidence base for specific scientific or health claims SMEs are proposing	Help signpost available support (financial and other) available locally or virtually
Production cost controls	Provide scale-up support for new products through subsidised facilities
Failure to raise the minimum venture capital -- investors do not wish to take any risk	Provide pitching opportunities with relevant investors
Timescales. Due to the nature of health related technology, evidence gathering can often be lengthy (e.g. carrying out an RCT), which can harm an SME's ability to stay afloat and generate cash flow	Outsource: share cost and resources e.g. work with a University to develop a database of certified activities of nutritional principles dose related

3.2.3 Research, Evidence, and Methods

Experts generated 8 barriers in the Research, Evidence, and Methods category. This category consisted of issues relating to the potentially limited research capacities of SMEs, and inadequacies in nutritional evidence available for SMEs to use in developing their product or service. The following are a sample of barriers which, following review, experts focused on for the generation of options to overcome barriers in this category.

Table 11. Research, Evidence, and Methods: Barriers and options

Barrier	Option(s)
Lack of SME's capacity to carry out effective user research and therefore create effective behaviour change interventions	Create specific multi-disciplinary SME groups (nutrition, IT, engineers) for designated research and development programmes
Lack of efficient methods for detecting specific target groups -- how are the specific nutritional needs of a person identified? (Phenotyping)	Collaborate with health authorities and/or experts to develop efficient and validated screening methods for nutritional needs and wants
Access to patients to test effectiveness	Find clinical champions who can provide access
Inadequate basic knowledge among medical and public health practitioners in terms of what PN entails and its utility	Link training and increased knowledge to competencies and accreditation of public health practitioners



3.2.4 Business-related

Experts generated 12 barriers in the business-related category. This category includes barriers to innovation which did not relate to the product per se, but rather broader factors of developing a viable business around Personalised Nutrition innovation. These included, for example, issues related to: SMEs' lack of experience in commercialisation, lack of market knowledge, and the need to get "buy in" from the retail sector. The following are a sample of barriers which, following review, experts focused on for the generation of options to overcome barriers in this category.

Table 12. Business-related: Barriers and options

Barrier	Option(s)
PN innovators have no history of commercialisation	Deliver entrepreneurial development skills and strategy training and incubate SMEs together
PN innovators don't know how to partner with businesses to develop products or solutions for them	Find companies/SMEs who have experience which Personalised Nutrition innovators are lacking and form collaborations
To examine the PN innovation's properties (health-promoting potential, etc), the SME may lack access to university/academia/external experts with the specific competencies needed	Form a personalised nutrition consortium of SMEs, Universities, and corporation by matchmaking, lobbying for policy/healthcare changes, and/or partnership grants
Conflict between traditional foods and new one	Make products complimentary

3.3 Competencies needed for effective innovation

During stage three of the workshop experts were asked to develop a set of competencies which they believe to be key to SMEs innovation efforts in the context of PN. This stage involved the experts engaging with both scenario-based design, and ideawriting, techniques. For the purposes of scenario-based design, each group was provided with one of the following scenarios:

Table 13. Competency scenarios

Scenario 1
SME1 (health and nutrition company) and SME2 (app developers) are working together with a GP to develop a solution to promote a healthier lifestyle in older patients. They want to increase fruit and vegetable intake as well as increase levels of physical activity. They are unsure if this age group will engage with apps and are also aware that certain strategies (e.g. message types, goal setting) are more likely to result in the desired changes in health behaviour and would like to find some advice and guidance on this from a health psychologist. The GP believes that it would be useful to set personalised goals for patients and have an easy method to track their progress but



is unsure what the most effective method might be. He has considered using health apps to track diet and exercise but is concerned that there may be privacy or regulatory issues that may pose legal or ethical issues. Both SMEs agree and propose working with an expanded team that includes local health and nutrition regulators.

Scenario 2

SME1 (technology company) and SME2 (health and nutrition company) are working together with a large supermarket group to develop an easy to use food scanner that older age group can use when they are shopping in the newly revamped personalized shopping supermarket. They are aware that food labelling is confusing for this age group when trying to select healthy foods that are suitable for their needs whilst shopping. They are considering a scanner that can read bar codes and that can be personalised to individual dietary requirements contingent on allergies and comorbid medical conditions that older adults have reported upon in collaboration with their GP. The scanner would read red, orange and green (as a simple indicator of no, ok and yes!). They believe this solution will overcome many traditional barriers to healthy eating and not require a high level of tech knowledge from this age group. They need to work within current medical guidelines and consult local health and nutrition regulators. They are also unsure of how much demand there is in the market, or whether older people would engage with the technology, and thus they decide to work with a local market research company. They are unsure how their product would reach the market and whether GPs would be willing to 'prescribe' it to their patients with specific dietary requirements.

Scenario 3

SME1 (personalised health and nutrition company) and SME2 (food production company) are working to develop a solution for older people with arthritis to eat a diet promoting good 'bone and joint health'. They would like to both educate this population on the impact of certain dietary factors (e.g. calcium) on promoting healthy bones and joints and halting reductions in bone density and to market attractive products that consumers will buy. They are working on a range of new products and want to develop something that is appealing and a desirable purchase for this age group and that will sit reasonably well within the typical preferences of this population. Working in collaboration with nutritional science experts at a local university, they would like a range of product that easily meets daily recommended levels of essential nutrients for healthy bones and that health care providers and pharmacists in their region would be happy to prescribe or recommend as part of a healthy diet. They are considering innovative products that are profitable and will yield real health benefits. They are keen to avoid products that might contain other ingredients that might aggravate symptoms of arthritis in this target group.

Scenario 4

SME1 (personalised health and nutrition technology company) and SME2 (food production company) are working together with a view to providing modifiable and flexibly changing ready meal products that are suitable for older people who have coronary heart disease (or



hypertension) and are on specific programmes of dietary change and physical activity rehabilitation supported by their local health care provider. They would like to produce well balanced meals that are low in salt and sugar, contain adequate levels of protein, vitamins etc. and a reasonable level of calories suitable for an older person. They would like detailed nutritional guidance from nutrition experts who work with older adults on what food types are appropriate for different stages of the rehabilitation process. They would also like access to health screening and behavioural data for the target group from health care providers to incorporate into their technology app platform and adjustable meal production process. They would also like to conduct some market research to generate product ideas, as well as to conduct ‘taste tests’ on and to get feedback on appropriate price points. They believe that packaging is very important to ensure the product is appealing. They would like to explore a method to have large retailers stock their product to increase market reach.

Experts initially generated a set of competencies individually, before discussing and further developing these ideas in their four groups. As a group, they then selected what they felt were key competencies, most critical to the innovative success of SMEs in the context of developing effective PN products or services for older adults. Below is an overview of the types of competencies which were suggested by experts, including select quotes from the discussion.

3.3.1 Collaboration competency

- This competency was highlighted by each of the four expert groups. Experts noted that it will be crucial for SMEs to have a strong competency for collaboration as innovation in this context is likely to involve engaging with a wide-variety of experts from business, healthcare, research, and policy, as well as end users. It was noted by experts that SMEs should have the competency to:
 - Identify areas in which they need additional expertise or additional partners
 - Seek out this necessary expertise/additional partners (e.g. GP, Health Psychologist, Health economist)
 - Be willing and able to work with these experts or additional partners
 - *“They seek out, through the collaborative competencies, a GP who suggests that you get a health psychologist involved too and now we have a collaborative group involving SME 1 and SME 2, where the principal lead, the GP, is giving exposure to the patient group and a health psychologist to give advice.”*
 - *“When we looked at the scenario, I guess we identified that the competency was collaborative competency, they need to be able to collaborate, to work together. So, that's a cross-sector competency”*
 - This competency also includes awareness of the collaborations they need to form. That is, SMEs need to have the capacity to identify aspects of the



innovation context in which they need external or additional expertise or input

- *"Ok, we do need behavioural scientists, we need "whatever else" and can you help us in that? Can you help us to meet those people that have interest in this area? Even if we haven't managed to identify those people. At least we know the competencies we need to make this product successful. "*

3.3.2 Business competency

- This competency was also highlighted by each of the four expert groups, but the emphasis within this varied. Some groups described this as an over-arching competency, within which there were sub-competencies such as Market Analysis, Fundraising, and User Engagement, whereas other groups treated these as individual categories of competencies. Regardless of the specific way in which this competency was described by experts, it was deemed by all to be of vital importance to an SME's ability to successfully innovate PN solutions for older adults across all scenarios.
 - *"Within that would fall things like the legal side, marketing, all the regulatory affairs including things like "health claims". They need to know that. So, whether they have it themselves or they have someone else that they bring in, that's what they would need to be able to bring this to market."*
 - *"Cross-cutting all competencies, is a business competency. So, you need to have a business competency within the general practitioner practice service, which now in modern times, is the norm. You also need to have, obviously, a business competency within the SME 1, SME 2 drivers, and you also, the health psychologist, in part, will have to have a business competency because of user engagement."*

3.3.2.1 Fundraising competency

- Linked to the business competency, is a fundraising competency. Experts felt that fundraising will be driven by the SMEs but with input from other partners.
 - *"Realistically, it could be a multi-pronged approach. I see the fundraising component, which could for example be a crowd-funding bid, as one which can be driven by each other's team members"*

3.3.3 Market analysis competency

- Related to the business competency, a Market Analysis competency was identified as a key driving competency in initiating innovation efforts. Experts highlighted the



critical nature of SMEs being willing and able to conduct a thorough market analysis, which would serve as a platform for future innovation activities.

- *“the initiator for this effort would be a market analysis competency”*
- Experts suggested that key tasks to which this competency would apply include:
 - Identifying gaps and problems in the market
 - Identifying potential for financial gains
 - *“So, then we have a team of SME 1 & SME 2 with a market analysis competency to identify gaps and problems. Obviously, the outcome is financial, from a SME perspective”*

3.3.4 Consumer understanding/User Engagement/Behaviour Science

- Each group of experts stressed the importance of engaging with, and understanding, the consumer. This, along with some of the technical competencies below, was described as crucial to ensure that the product addresses consumer needs, and will be seen as attractive and usable by the consumer. It was suggested again that this competency may require SMEs to collaborate with other experts e.g. in collaboration with GPs, Health Psychologists among others. This competency also reinforces the collaborative competency, by again highlighting the need for cooperation and engagement between a variety of stakeholders, each with unique expertise which will be critical to the careful design, development, and delivery of Personalised Nutrition innovations.
 - *“Both in terms of how consumers behave, what they might buy, what they eat and also, the whole behaviour science and behaviour change as well. So, are people ready to receive this information? Are they ready to change their diet? Or do they know how or do they have the skills? The consumer science probably fits more with the SMEs, and the behaviour science background should be the healthcare providers that have it. So we have it very much from the beginning, what people need, rather than getting it to product before considering that. That's kind of the way we approached it.”*

3.3.5 Technological competency

- Experts discussed the need for SMEs to have knowledge of, or at least access to knowledge of, the technological intricacies of developing the product, as well as a good insight into design innovations which will enhance the efficacy of the product, as well as its appeal to end user. Experts linked this competency back to both the Market Analysis competency, and the User Engagement competency. Experts highlighted the fact that it is not enough to design a technological solution which in itself seems useful, without considering and investigating how potential users are likely to interact with the technology. Experts noted the need to avoid assumptions



about the user behaviour, and the need to carefully explore the utility of technological innovations in the context of the daily lives of potential users.

- *“That's the other side of technology design, gamification. Gamification is where it's rewarding to have behaved in a particular way, after the nudge. You know, those type of solutions work if they work, in other words if the gamified element is interpreted by the older adult as indeed rewarding.”*
- *“My key thing here, in terms of the app, isn't so much the design of it, but rather the usage of it. So, there is a company, recently, which tried to develop a shopping list app for people to use in supermarkets and they made all these assumptions about consumer. They thought “we're going to develop this really great app that's going to help you do your shopping”. So, the first thing, they made the assumption that people of a certain age profile, hipsters, who go to this particular supermarket which is “Wholefoods” in the US, would be always on their phones. Well, when they went and watched them in the supermarket, they didn't use their phones at all. So it totally blew apart the whole premise of using your phone to plan and buy food”*
- *“It kind of comes from both sides: the technologist needs to understand how it's going to be used; they build first and then they try to figure out who needs it afterwards - that's a typical problem with technologists. So, they make the cool app and they think, now who's going to buy it? Really what they've got to do, is that they have to watch the user. Watch how they carry out the workflow at the moment. Think about how they can improve it through the use of technology, and augment what they're doing at the moment. Don't try to move them too far away from their current routine but at least, make it work for them, by integrating the technology into their current workflow and changing behaviour.”*

3.3.6 Nutritional/Health competency

- Experts felt that, in most cases, SMEs should draw upon the expertise of nutritional scientists and health care professionals in the design and development of their innovation. However, experts also suggested that SMEs need to have a certain level of understanding of the science themselves. This is especially relevant when the innovation is targeted at a specific subgroup of older adults, for example, those that have coronary heart disease. In such cases, experts noted that it is critical that SMEs have, or engage with those who have, sufficient expertise which allow them to develop a targeted intervention.
 - *“We teach in medicine that first, get the status of the patient and in this case, I believe that we get the nutritional status of the patient. We should get a profile about the patients; it was not listed on the scenario, but I do*



believe that this is the first step. To describe the status of the patient, what is needed for this patient and we believe that this part should be performed by SME1 in cooperation with a nutrition expert. It's a question: it's connected with an SME or connected with the healthcare provider. This is the first step, this nutritional profile. What is appropriate?; What is too high or too low in volume in their diet, and what is missing? Maybe we should evaluate this data, considering the medical data of the patient. This should come from the healthcare provider and, of course, also the SME should have some knowledge in this regards, which medical condition can be influenced by nutrition."

- *"And there is a healthcare provider involved, because we focus on people that have ,for example, coronary heart disease and hypertension, so they need specific dietary advice. There's also a nutrition expert involved and that person will provide detailed, and additional guidance. And there will also be health screening and data about this target group."*

3.4 Criteria for evaluating SME competencies

During this final stage of the workshop, experts generated a set of suggested criteria which may be used to assess whether or not applicant SMEs have the competencies necessary for successful innovation in the context of Personalised Nutrition. These criteria were developed in light of the challenges, barriers, and competencies which experts had carefully reviewed, considered, and discussed in the earlier stages of the workshop.

In completing this task, experts generated criteria for (a) specific components of the INCluSilver voucher scheme and (b) generic indicators of strong competencies. As regards (a), experts generated suggested criteria for the following vouchers: Ideas Innovation voucher; Scalability and Internationalisation voucher; Demonstration voucher; Technology Transfer voucher; and, the Economic Feasibility voucher. These suggested criteria are presented in table 14.

In considering the Idea Innovation voucher, which seeks to help maturation of the relevant ideas and project (emerged from Innovation Guild) with needs for making concrete the partnership, experts agreed that it is critical that certain criteria are met in relation to the idea which SMEs seek to implement. For example, experts frequently stressed the importance of an evidence based approach to innovation, whereby members of the SME team draw upon recent evidence in the design of their innovation idea. Similarly, it was frequently noted by experts that this idea should be designed to tackle a specific problem, with clearly defined outcomes, and have the potential to shape consumer behaviour.

In considering the Scalability and Internationalisation voucher, which seeks to aid in transferring an innovation to market in and outside EU (design, market analysis, international consultancy), it was frequently noted the SME should have a pre-existing international network which they can exploit, including both domain-experts, and stakeholders. Furthermore, experts noted that SMEs should



have conducted sufficient market research, and also be aware of any likely barriers to scalability and internationalisation.

As regards the Demonstration voucher, which facilitates the demonstration of technology readiness in operational environments in collaboration with living labs and large scale demonstrators, experts noted the importance of SMEs demonstrating evidence of engagement with end users, as well clearly describing how their product addresses the needs and priorities of end users, among other criteria.

In discussing the Technology Transfer voucher, which will be designed to assess the transferability potential of some technology or knowhow to another sector or solve a technical problem to enable the transfer, experts suggested that SMEs should be able to clearly describe the malleability potential of the technology to different contexts, and also be able to demonstrate the need for, and potential outcomes, of a technology transfer.

Finally, in relation to the Economic Feasibility voucher, which is designed to assist strategic decisions. The analysis will consist of a comprehensive analysis of competition (such as competitive firms, products etc.), analysis of environmental and of regulatory considerations, experts highlighted the importance of SMEs demonstrating sufficient knowledge of costs and sufficient knowledge of competition. Experts also suggested that SMEs should have a realistic idea of where additional required funding will come from i.e. have identified other potential sources of funding, among other criteria.

Table 14. Suggested criteria linked to innovation vouchers

Voucher	Criteria
Ideas Innovation - Help maturation of the relevant ideas and project (emerged from Innovation Guild) with needs for making concrete the partnership	<ul style="list-style-type: none"> • The idea addresses a specific problem which currently lacks a solution • The idea aligns with national and/or regional priorities • The idea draws upon existing evidence • That it addresses a real consumer need and has the potential to shape consumer behaviour • That the outcomes are clearly defined and signposted • The SME has partners identified to generate ideas • The SME has workshops identified to attend
Scalability and Internationalisation - Transfer an innovation to market in and outside EU (design, market analysis,	<ul style="list-style-type: none"> • The SME shows evidence of having an international network that they are active in and can draw upon • They have identified stakeholders in the EU



international consultancy)	<ul style="list-style-type: none"> • They have identified key barriers to internationalisation • Primary market research has been carried out • A clear understanding and appreciation of likely barriers and opportunities is shown • Priorities for territories or markets have been made and justified • Evidence that a local implementation is already up and working is shown • Evidence of a professional partner in the target country is shown
Demonstration - Demonstration of technology readiness in operational environment in collaboration with living labs and large scale demonstrators	<ul style="list-style-type: none"> • The SMEs has indicated milestones that they will hit so they can demonstrate awareness of risks, and how they can overcome those risks • End-users have been identified and engaged with • That the attractiveness of the product to the senior or decision maker is described, and clearly aligned to their priorities and needs • That key assumptions are described for testing before full resources deployed • Prototyping: clear objectives for development are formed
Technology Transfer - Assess the transferability potential of some technology or knowhow to another sector or solve a technical problem to enable the transfer.	<ul style="list-style-type: none"> • Malleability potential is demonstrated, in terms of taking, refining, listing products, and putting them in different contexts, clearly demonstrating the tech-transfer potential and the malleability potential to different contexts • The SME is aware of sources of the required technologies and have acquired letters of support to say that they are willing to license/sell/use freely the technology • A market need for the transfer is demonstrated, with a projection for the outcome of transfer
Economic Feasibility - Assist strategic decisions. The analysis will consist of a comprehensive analysis of competition (such as competitive firms, products etc.), analysis	<ul style="list-style-type: none"> • Demonstration of knowledge of costs, and where finance will come from • Demonstration of knowledge of competition • Evidence of a detailed market



<p>of environmental and of regulatory considerations.</p>	<p>analysis/segmentation/ life time value of customers.</p> <ul style="list-style-type: none"> • That it considers the priorities of the senior and/or decision maker when proposing a competitive analysis • Demonstration of a realistic understanding of likely costs for any activity and if not fully covered where residual investment will come from • Future viability of individual companies or consortium members • Knowledge of the overall value of the market • That they are realistic in terms of sales and how much it is going to cost their core customer
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As regards (b) generic indicators of strong competencies, experts also develop a set of criteria which do not apply to a specific voucher, but related either to key competencies of SMEs developed in the previous stage of the workshop, or other criteria which experts considered to be useful in identifying quality voucher applications. These include, for example, demonstrating that the SME team is well-balanced, with the necessary expertise and clear delegation of roles; that the idea is consistent with the expertise and experience of at least one member of the group; and that the SME have considered any potential ethical issues. The full list of generic criteria are presented in table 15.

Table 15. Generic criteria

Generic criteria
Correct make-up of the team, that it is balanced in the appropriate way. This involves having the necessary expertise, and also clear leadership and designated roles, alignment of expectations of who is doing what
The SME has a viable plan
The idea involves an evidence based intervention
Integrates appropriate IT solution
The SME have a nutritional knowledge competency
The idea is based on existing technological solutions
The idea is consistent with previous experience of at least one of the partners
That it is based on sufficient market understanding and clear indication of potential
That it demonstrates it can be a sustainable business model taking existing habits & behaviour



into account while also being disruptive
That it is based on making use of existing technologies and nutritional expertise while not making life more expensive for the elderly
That it complies with clear timelines (start – finish)
That it complies with the observation that no other enterprise did it before
That it addresses a specific nutritional need of the population > 50
That it complies with current regulatory rules
That it responds to an identified need/market
That the SME has a realistic view on possible impacts in terms of return of investment. Must include an indication of the likely timescales for adoption so project can support short-term/medium-term/long-term opportunities.
The route to market is well-described and feasible
There is a clear outline of any potential ethical, data protection or privacy issues, as well as the inclusion in risk register for project
That the idea addresses consumer needs and wants, based on the consumer research in the relevant target groups
That it involves experts with a track record from relevant areas in a collaborative manner
That the end user is involved in the development process
That it results in accessible, easy to use, health promoting, durable solutions for older people that fit their lifestyles
That it is or has a plan to regulated by a reputable body
That it is consistent with best practice or improves on it (healthcare).
That the SME has the capacity to fulfil the voucher
That it draws upon a comprehensive risk analysis to avoid pitfalls and that a plan B exists when relevant
That it addresses the contribution of the different partners to ensure alignment of expectations (also in relation to responsibility) and potentially IPR rights
Evidence of knowledge of environmental & regulatory considerations
Clearly describe how this voucher, and the advance it can help them to make, fits into their progression plan i.e. where they will go next
Transparency in terms of feasibility, what can the team do, what can they deliver



4 Conclusion

Utilizing a collective intelligence and scenario-based design methodology, input was gathered from the eighteen members of the INCluSilver panel of experts, to gain insights into (a) challenges to the design of effective and efficient Personalised Nutrition services for older adults, (b) barriers which SMEs face in working to innovate in this context, (c) competencies needed by SMEs for successful innovation in this context, and (d) criteria which can be used to assess these competencies.

Over the course of the two-day workshop, a set of 172 challenges to the design of effective and efficient personalised nutrition services for older adults was generated. These challenges were arranged into seven categories by the facilitation team: A) Policy and Health Care Systems, B) Logistic, Design and Packaging Solutions, C) Diet and Food Production, D) Determinants of Diet and Physical Activity, E) Functional Food and Nutrigenomics, F) e-Health, and G) Information and Social Networking. Following a series of fruitful rounds of discussion which sought to generate options to overcome these challenges, a set of targeted options for addressing some of the most critical of these challenges was generated. Subsequently, experts generated a set of 45 barriers faced by SMEs seeking to innovate in this context, and a corresponding set of well-reasoned options for overcoming these barriers. Again, these barriers were arranged into categories: A) User Need and Characteristics, B) Resources and Regulations, C) Research, Evidence, and Methods, and D) Business-related.

During the latter stages of the workshop, participants were facilitated in engaging in scenario based design, at which stage they generated a set of concrete and specific competencies which are necessary for successful innovation of PN solutions for older adults. Experts generated a wide-ranging set of competencies, which addressed each of the following domains: collaboration, business, market analysis, consumer understanding, technology, and nutritional/health science knowledge. Finally, building upon these competencies, experts generated a set of suggested criteria which may be used to evaluate proposal from SMEs applying to the innovation voucher scheme.

The results of this CI session represent an important contribution to WP1, which sets out the INCluSilver Market Intelligence and Strategy Setting. Together with D1.3, which involves the use of survey methods to analyse stakeholders considerations, criteria, barriers and facilitators to the design of market-led solutions for PN for older adults, and D1.6 which provides further exploration of the competencies needed for the successful development of PN for older adults, as well as barriers to be overcome, and options to do so. Together, these three deliverables will provide a comprehensive market intelligence analysis which will contribute to the design of the Collaborative Virtual Environment in WP2, the Innovation Voucher Scheme in WP3 and the Innovation Support Services in WP4.



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Appendix A: Full Set of Categorised Challenges and Options

A: Policy and Health Care Systems

1. Lack of a legal, ethical and societal framework to ensure genetic information about food and disease is appropriately handled.
 - Facilitate data collection and learning as well as making it part of Personalised Nutrition solutions in a safe (in terms of privacy) way (also applies to: 7)
 - Government to make money available to encourage diet and health interventions to generate supporting data (also applies to: 3, 5, 12)
 - Demand programme from government to promote: Lifestyle changes and healthcare changes
 - Private funding for possible research in nutritional intervention trials
2. Economic interests blur health nutrition facts
 - Demand that EU wide companies add traffic light QR codes on products as a nutritional summary
3. Lack of objective clinical trials evidence for long term benefits
 - Encourage (make funding available) for diets and health interventions supporting Personalised Nutrition (also applies to: 5, 12)
 - Promote lifestyle changes
 - Promote public intervention research with private funding
 - Develop systems to award positive behaviour change that can be used by government and health insurance training (also applies to: 9)
4. Pricing of certain foods which can make them unobtainable by lower socioeconomic groups
5. Need detailed nutrition and health surveys of older people to compliment current survey data
 - Promote with scientific societies to review of evidence and the writing of statements related to this
6. Need a food and nutrition policy to use the detailed survey data
 - Facilitate data collection and learning in "safe" way, taking privacy into account (also applies to: 1, 7)
7. Lack of infrastructure support for delivery (e.g. IT and record linkage) within the local/public sector
8. Lack of money and limited financing of preventive actions / nutritional care
 - Set a minimum limit for prevention resources in the national budget (as a percentage



of GDP)

9. Lack of training of health professionals on the importance of nutrition, the means of implementation, and on practical application of PN
 - Make Nutrition courses compulsory for every health professional
 - Develop systems to award positive behaviour change training
10. Lack of understanding of the clinical condition to be considered in the application of PN
 - Make known (through flyers or other infographics) the links between specific senior health conditions and associated nutritional deficiencies
11. The potent lobby activity of drug and device companies exhaust public resources, the financing of life style related interventions in insufficient
12. Life style interventions are hardly accepted as Health Care efforts
 - Require lifestyle interventions as prerequisites of more expensive service financing (also applies to: 14, 15, 17)
13. The non-communicable chronic diseases are extremely complex and are poly-genetic in multiple systems, and the genetic component of personalised nutrition may not be of any significance for a decade or so.
14. Lack of focus on disease prevention but only focus on disease treatment (i.e., using medication)
15. Lack of flexibility within the health care system to introduce PN
16. Lack of institutional economic support for PN service provision
17. Sustainability and fund raising challenges
18. The challenge of contradicting accepted beliefs and overly theoretical or fake scientific information related to elderly persons
 - Identify false information and share the fact this it is false efficiently with relevant target audiences
19. The challenge of transforming the care system
20. Limited budget for meals in nursing homes, which also needs to cover costs for nutritional supplements.
 - Develop information packs and/or dissemination materials on nutritionally beneficial yet moderately priced options (also applies to: 4)
21. Limited admission to elderly homes and older adults staying at home for longer with no



professional support for adequate nutrition

22. Lack of central system that covers information on health, nutritional needs & dietary preferences
 - Promote scientific statements from societies with advice to SMEs
23. Official protein intake recommendations for older adults lag behind current evidence (i.e. are too low)
24. Availability of dietetics in primary care
25. The need to state what is a Nutrient and what are Medicines

B: Logistic, Design and Packaging Solutions

26. The need for food packaging to take into account the difficulties experienced by elderly people
 - Promote design input using subsidy (also applies to: 30, 31, 36, 37, 42, 43, 48, 50, 51)
27. Need for TV information system and familiar TV control User Interface ordering system (i.e., integrated smart TV app) to support service delivery
28. The challenge of designing packaging device that reads QR barcode with ingredients served and senses patient-user ID
 - Standardisation or group adoption of codes
29. The challenge of promoting health literacy
30. The challenge of designing readable packaging (e.g., large type)
 - Conduct ergonomic studies
31. The challenge of designing easier to open packaging
 - Encourage innovation in packaging integrated with QR coding
32. The challenge of integrating sensor technology in packaging to highlight food issues (e.g. out of date product)
 - Encourage innovation in shelf-life extension and adoption of Internet of Things or sensor monitoring – Make this a priority for funding (also applies to: 41, 49, 51)
 - These sensors can provide information on, for example, use-by dates, and whether or not the products have been outside of the recommended temperature range e.g. as used in pharmaceuticals
33. The challenge of motivating fresh food use and use of less packaging



34. Developing a more basic paradigm for delivery of food
35. To develop the means of distribution at home
36. The challenge of highlighting the nutritional benefits of products for the elderly on packaging
 - Establish the use of standard messages delivered by a government agency
37. Appealing packaging that is appealing yet meets all regulation across Europe for food labelling and health claims
 - Compensate SMEs for cost of compliance
38. The challenge of designing distribution systems to make access easier to old people
 - Create business models to facilitate distribution to elderly recipients (also applies to: 39, 45, 46)
39. For elderly the geographical distance determines in many cases access to services, so they take the nearest, but not the most appropriate products
 - Organise a delivery chain similar to the delivery chain for medicines to reduce costs
40. A large proportion of the Europe diet is non-packaged including both foods (fruit, vegetables, potatoes, bread, poultry, pork, beef, fish, eggs, cheese) and meals purchased outside the home (averaging 25-35% of energy). Packaging is important but should not be the only priority
41. The need for methods to ensure sufficient shelf-life of convenience products
42. Lack of understanding that product appearance is essential
43. The challenge of simplifying and downsizing packaging for the elderly, and designing easy to use packaging (e.g. directly to micro wave)
 - Conduct user engagement research with older adults
44. The challenge of building an IT based network for personalized dietary recommendation
45. The challenge of making an efficient logistic channel for local bio-food producers for reaching the local communities
46. The challenge that older people may be less able to do their groceries themselves or do it less frequently.
47. The challenge to provide the right meal at the right time (i.e. to deal with changing appetite)
48. The challenge to engage older adults in their meal, even if they can't prepare it themselves any more, to increase self-esteem and individualize their meals according to their preferences
 - Design apps for elderly to order their food taking their preferences/needs into



consideration

49. The need for food packaging to take into account the vulnerability of older people for food poisoning (e.g. when eating leftovers)
50. Arthritis and poor eyesight as barriers to packaging and ADLs
51. The need to develop indicators on packaging suggest to customers nutritional and/or therapeutic goals

C: Diet and Food Production

52. The need to provide the food industry with more knowledge of the effects of food on health
 - Create attractive opportunities for collaboration between industry and universities (knowledge-transfer)
 - Provide scientifically based guidelines for SMEs on nutritional needs of the elderly
 - Establish a peer reviewed framework to provide action items for SMEs and food industry with knowledge of the relationship between food and health
53. Metabolomic science needs to advance understanding of measurable needs in food intake
54. The challenge of effectively washing food given the range of fertilizers, pesticides, antibiotics that may cause health problems
55. The challenge of aligning recommendations/expectations with realistic product opportunities for industry
 - Ensure that there is awareness that an innovation can only become a success if it is palatable and acceptable by the consumer
 - Promote 'slow implementation' to overcome meet habits. Innovations should seek to slowly work to change old habits rather than drastically change traditions or behaviours which have long existed for the older adults
 - Establish cooperation with national professional organisations for reliable advice
56. Cost of generating strong evidence base for different population groups
57. The challenge of understanding key nutritional issues among the elderly, e.g. related to muscle wasting (sarcopenia), cognitive decline, and age related macular degeneration
58. The challenge of providing for more calcium and vitamin D for elderly female population, in particular
59. The challenge of promoting responsible, knowledge-based food production practices based on



scientific evidence

- Create opportunities for industry-university collaboration
- Promote evaluation by independent authorities

60. The challenge of negotiating tax incentives on locally produced, healthy foods

61. Designing products specifically tailored to the elderly

- Promote 'food design' specific to the elderly e.g. with fortification
- Design innovation user interfaces (e.g. voice command, rather than buttons) and implement automated feedback from users (also applies to: 76, 77)
- Develop strategies to identify older adults' requests and demands

62. Training of food professionals to the specificity of the elderly

63. To balance the disconnect/miscommunication/misrepresentation between science and what companies can logistically claim

- Promote knowledge transfer from independent authorities

64. More knowledge needed in animal feeding for human consumption and transgenic veg uses

65. The challenge of evaluating if nutraceutic uses of food are possible

66. Only multination companies are able to determine the nutrient content of their product, but the generated information is hardly accessible in public databases

- Increase awareness of the ability to access publically available nutritional databases like USDA for appropriate nutritional data (also applies to: 67, 74)

67. The nutrient content analysis is beyond the purse of SME's, and the public support of this activity is missing

68. Trans national food companies (the top 10 account for just 3% of global sales of packaged foods) are 100% au fait with all diet and health issues. The big challenge lies in the 95% or so of SME's who dominate LOCAL food supply. Serious work needs to be done here but there are financial barriers to such companies who operate on very short cash flow system

69. The potential need for equipment investment for introduction of new product categories/packages

70. Lack of believe in a stable and future customer segment (risk willingness)

71. Insufficient raw material supply

72. Create a link with pharma companies (customized food related to pathology and cross effects)



73. National Health Services should create a pathway to facilitate the correct use of food (e.g., via diet experts)
- Encourage cross NHS food-industry collaboration aimed at highlighting needs, and maintaining health and wealth. The state has lots of data at the population level which can be used for research
 - Create stakeholder mapping and set up advisory panels for SMEs to include consumers, providing them with an opportunity to advise SMEs of unmet needs or validate current propositions
74. The need for reliable nutritional data from the producers
75. The challenge for marketing e.g. a small company producing healthy local food cannot fight with a large multinational producing junk food.
76. The need to provide attractive, tasty & nutrient rich food products that take into account the difficulties experienced by older people (e.g. dysphagia, dyspraxia)
77. The need to provide attractive, tasty & nutrient rich food products that take into account the altered sensory perception and individual taste preferences of older adults
78. Stimulation of the food industry to become a partner for change and respond to the needs of older population
79. The challenge of setting up a data-base filled with local food habits crossed with epidemiological data

D: Determinants of Diet and Physical Activity

80. The challenge to provide nutrient-dense, sustainable plant-based food products that meet the nutritional requirements of vegetarian/vegan older people
81. The challenge of preventing diet-related chronic diseases and increasing the quality of life for older adults
- Incentivise prevention rather than treatment, through government funding (also applies to: 82)
82. The challenge of understanding how quantity and quality of food can be integrated into a healthy lifestyle including exercise, stress reduction activities, and controlled use of alcohol, etc.
83. The challenge of personalising nutritional needs and physical activities to older populations whom may have mobility issues
84. The challenge of supporting education/awareness regarding importance of good nutrition for



healthy active aging

- Develop initiatives in the three clusters of elderly (go-go, slow-go, no-go) focusing on activities related to a correct diet for their respective needs

85. Much more basic science to unravel causes and clinical/public health consequences of “healthy” diets

86. The challenge of understanding factors governing food choice in the elderly

- Establish a list of existing databases from EU Projects (e.g. Food4Me, Helena) which SMES might use to better understand the drivers of food choice to tailor food solutions via Personalised Nutrition
- Promote the conducting and dissemination of scientific studies linked to real life attitudes
- Promote consumer science studies in older adults, who are often left out because they are more difficult to study
- Bring in behaviour change specialists

87. The challenge of disseminating public health messages on the links between nutrition and active healthy aging

- Develop products/programs/services that fit the lifestyle and traditions and/or habits of older adults rather than trying to change them to something completely different
- Promote consumer science studies in older adults to understand food choice behaviour and apply learning in effective products
- Understand and identify how target groups currently consume information. Model on successful organisations.

88. A challenge is the strength (lack of) evidence-base on PN for older people – and the multifactorial and multigenetic nature of most age-related diseases/conditions

89. The challenge of creating palatable, easy to eat, healthy, cheap foods that make them the first choice for consumers

- Establish incentives for SMEs to invest in research and development in this area
- Promote, via subsidies, submissions for health claims via EFSA

90. How to increase satiating properties of food without increasing calories

91. The challenge of designing life style interventions that target families and not just individuals.

92. Insufficient willingness to change lifestyle



- Identify the different target groups and embed behavioural science into interventions, For example, some groups may be more open to change, whereas others may be more set in their habits
93. Insufficient access to appropriate personalised diet and exercise facilities
94. The challenge of designing tailored sport-diet programs
95. The challenge of promoting institutional involvement in awareness campaigns
- Encourage institutional awareness programmes with key messages at country and EU levels
96. The challenge of addressing old (but not healthy) diet-related cultural traditions
- Establish “champions” in communities
97. The challenge of too many gadgets but lack of social action for effective dietary and physical activities
- Establish possibilities for older adults to communicate and work together on a healthier diet and level of physical activity, allowing them to interact with others who are working on a similar programme or are in the same situation
98. The need to take into account that overweight as well as undernutrition and sarcopenia obesity can be a problem in older adults
99. The challenge to combine nutritional and physical interventions to maximize impact
- Encourage integrated IT solutions for diet and physical activity in Personalised Nutrition
 - Encourage policies which integrate diet and physical activity in health promotion, leading to programmes which are mainly personalised by SMEs
100. The challenge of designing education programmes to change bad habits
- Promote programs that not only focus on education, but that change the environment and include social network
101. The challenge of making costs sustainable

E: Functional Food and Nutrigenomics

102. Lack of a precise understanding of the mechanisms of action for nutrients and bioactive substances.
103. The challenge of developing nutrition supplements as pills or measurable content functional



foods

104. Time taken for studies and research versus industrial timescales in turnover of products, longevity of SMEs, and overall cost
 - Highlight the opportunity to take market share from the supplement market
 - Create a functional food market. Change consumer awareness of functional foods.
105. Understanding the parameters for inclusion of bioactives for functional effectiveness with background of variability in feedstocks
106. Understanding the epigenetics of dietary components, including phytochemicals and effects on inflammation
107. Understanding sterol/microbiome/ cholesterol lowering compounds in food
108. Dearth of research into gene X nutrient/diet interactions
109. Rationalising the use of functional foods based on genomic data
110. Designing clinical studies of the clinical benefits of functional food
111. Evaluation of the link between different polymorphisms in response to specific diet
 - Establish links between different organisations to make linkage between phenotype and response/needs possible
112. Challenge is whether individuals will respond (physiologically) differently to functional foods – can be dependent on other genes/alleles
113. Most functional foods actually lack usefulness and are publicity products
 - Have a national professional organisation assess new functional food products (also applies to 123, 124)
114. Medical Agriculture
115. We need real functional food, and scientific evidence of its utility
 - Establish industry-university collaborations for this research
116. The monitoring of drug intake is already a hard task, the monitoring of nutrition is still harder.
117. The financial background of great clinical trials is missing, because it is hard to get a patent for functional foods
118. Although we have a good understanding of the biology of diseases from diabetes to osteoporosis to heart disease, etc., less well understood, but of central importance, is human behaviour in respect of food choices
 - Try to make the consumer aware of functional foods as an alternative to food supplements (to create a functional food market)
 - Create awareness of customers towards functional foods
 - Study and publish best practices for maintaining user involvement and motivation
119. Lack of methodologies for phenotyping (determination of individual needs)
 - Establish individual needs and responses to functional foods and bioactive substances
120. Huge diversity in response to bioactive substances, and lack of understanding of potential differential effects of nutrients/bioactive substances across individuals or groups of people
121. The challenge of creating a link with pharma research departments



122. The challenge of a too strong financial influence over science. It is very expensive to research and even more expensive to validate Nutrigenomics
- Publish survey results and best practice for user involvement
123. Lack of convincing clinical trials.
124. The challenge to provide sufficient evidence from high quality studies conducted in the target population to support a (unique) claim for a (patented) ingredient/product
125. Specific challenges around metabolism and bowel habit of elderly e.g. constipation
126. Lack of match between local uses, foods, and needs

F: e-Health

127. The challenge of making food intake and feeding habits monitoring interoperable with different platforms (regulatory frameworks, available functional foods, etc)
128. Hydration, exercise, weight monitoring relatively easy, but food, ingredients, metabolomics measurements target monitoring, etc. is not easy
129. The challenge of designing QR labels that provide details of food ingredients and other key data relevant for PN service provision
130. The challenge of monitoring food intake, passive versus manual input
131. The challenge of digital exclusion and promoting ways to support populations who do not have digital skills
- Encourage alternative solutions or simplify the internet access
 - Promote social networks to facilitate mentoring in the use of digital technology
 - Establish digital skills programmes for older adults
 - Incorporate users in the design of innovations
132. How to use and incorporate genetic data into practice
133. The challenge of recording linkage and viability of a “live” real plate
134. Provide scientifically validated information through labeled websites
- Develop a shortlist of validated e-health tools or apps to be promoted by doctors, which are supported by health authorities
135. The maintenance of nutrient databases is a public function, but this function is not covered by the government in many Countries.
136. e-Health solutions typically concentrate on home measured physiological data and drug data, but rarely on nutritional data.
137. Insufficient understanding of diet’s influence on health in the target group (older adults)
138. Habits and reluctance to change eating patterns and lifestyle
139. Integrating e-health services into the chronic care model
- Ensure collaboration between public health and innovators at an early stage
 - Add e-health to the health science curriculum (students)
 - Promote a unique database, at country level, that can link all domains of healthcare (GPs, Hospitals, National Health Service) and relevant information. (also applies to:



143, 145, 146, 147)

140. The challenge of creating a certificated “institutional logo” and repository with correct scientific information (Q&A)
141. The challenge of industrial interests seemingly against a free and official national or EU wide food/nutrient data base
142. The challenge of current food safety regulations being overly liberal in favour of food producers
143. The challenge of limited e-literacy, reluctance or (perceived) privacy issues with sharing personal information online
144. The challenge to define an efficient set of questions to obtain useful information in relation to design of eHealth systems for PN service provision for older adults
145. The risk not to obtain correct/up to date information from users of e-health applications, which may negatively affect the service provided
146. Feedback is key...how do we measure and access measured data in this group
147. The need to collect data in a single shared format
148. The need to recruit the larger number of operators involved in welfare system

G: Information and Social Networking

149. The challenge of guiding health professionals in defining the key messages appropriate to facilitate the behavioural change required
 - Design e-learnings for professionals (also applies to: 157-161)
 - Promote and develop trusted brands or schemes to provide social media outlets with high quality information (also applies to: 153, 167, 169)
150. Need to generate tools to match PN user needs to various lifestyle options (e.g., different physical activities, daily routines) and PN
 - Set up recommendations for elderly based on their own profile and that of others by using digital platforms to collect and disseminate
151. The need for a social networking “fake information cleaner” for user groups that share experiences and provide virtual company
152. Dissemination of key messages not only via health professionals but through other outlets
 - Use "accredited" organisations and opinion leaders to share quality scientific info to all stakeholders (seniors, family, doctors, nutritionists) echoing the same message (also applies to: 167)
153. Safeguarding key messages; preventing distortion of the message when it is disseminated via social networks



- Provide a “trusted practices” list
154. Monitoring how and when real science is communicated and by whom
- Promote a ranking system with government control (also applied to: 167)
155. Improving awareness in the elderly of the importance of food/diet
156. Community platform of exchanges around the health of the elderly
- Provide context relevant “good” information for use by peer networks/clubs etc.
157. E-learning development for health professionals on elderly nutrition
158. The challenge is getting journalists, opinion leaders, public stars, to giving good information and say no to silly things. Health professionals are usually well informed and trained in informing their patients.
159. Social media distribute lots of uncontrolled information, the evolution of this sector to crystallize valid information is relatively slow
- Make a registered mark e.g. “certified information” (also applied to 160, 167)
160. Governmental activity at the level of social media is insufficient.
161. This is a big challenge in the age of social media where pseudo-science abounds. The key health professionals among older persons is the family physician who probably knows as much about nutrition as the family grocer!
162. Insufficient awareness that meals are a social event and introduction of PN may need to be compatible with existing meal habits
163. Lack of understanding that severe nudging can lead to negative results -> to achieve success the older adult has to feel that he/she has an actual choice / is the decision maker
- Mass media messages showing "good" examples (also applies to: 150, 164, 165, 166, 168)
164. The challenges of creating awareness campaigns through GPs, pharmacists and social networks
165. The challenge of designing a dedicated toolkit in pharmacy, hospitals and GPs waiting rooms
166. The challenge of elderly persons needing special methods to maintain their interest in lifestyle change. These include social networking and gamification in IT
167. The challenge of information overload. Since even the professional/scientific organizations are sponsored by various companies, the information they convey is often confusing and contradicting



- Promote collaborative networks between scientific societies for giving the same, simple message
168. The challenge of influencing the social peer network of elderly people to provide appropriate messages to facilitate the behavioural change required
- Use radio and TV programmes to disseminate good information
169. Difficulty in finding trustworthy sources due to abundance of health-/nutrition-related websites, blogs, e-shops
170. The challenge to reach those, who need nutritional support most, e.g. the less well educated or lonely older adults
- Develop a multi-channel networks dissemination plan (online/offline) to share experiences of "what works" (also applies to: 172)
 - Establish a social network platform to exchange information about diet and health for older adults
171. The challenge of educating seniors on what particular nutrition they should be having as a baseline
172. Lack of a network between seniors online (to share experiences / best practices / tips / etc.)



Appendix B: Full Set of Categorised Barriers and Options

A. User Needs and User Characteristics

1. Affordability - making the right choice for people the affordable choice
 - Engage with older adults to determine their specific needs
 - Establish knowledge on cheaper alternative food choice solutions
2. Lack of knowledge regarding the specific needs of the older adult population
 - Ensure knowledge transfer between academia and public healthcare
 - Ensure the SME has partnerships/input from those with nutritional expertise, if they do not have it themselves
3. Lack of capacity of Health Care professionals to respond to consumer interest
 - Ensure that consumers have access to/can seek relevant knowledge e.g. online
 - Design a combined public/private financing scheme (also applies to 6, 15, 16)
4. Mobile application alone does not work; elderly require a complex service, with lots of human interaction to guide life style changes
 - Ensure that mobile application interventions are integrated with personal guidance e.g. the establishment of network groups among older adults (also applies to: 11)
5. Lack of motivation on the part of older adults will be the barrier for SMEs.
 - Address this through an “Old Habits Die Hard” public health campaign
 - Create knowledge of what are the exact needs of older adults and of their typical behaviour
6. Trust may be a barrier: trust in the provider and trust in the security of the data
 - Ensure clarity and transparency in the information provided on data security
7. Inadequate IT solutions for older adults - they have rather specific needs with respect to GUI etc. which are often overlooked
 - Ensure the capability for consumer testing during the innovation development phase
8. Trust may be contingent on the providers -- older adults may trust smaller manufacturers/suppliers ahead of larger manufacturers
 - Ensure clarity and transparency support from public healthcare



9. Self-sufficiency: Some elderly may not be able to cook for themselves
 - Ensure that convenience has been considered as one of the key design requirements in the innovation
10. Silver age becoming middle age more and more, and more tech tolerant, there is no clear definition of needs and challenges and functions they can perform in technology environment
11. The challenge of creating a digital intervention for populations whom may not have the digital skills
12. Elderly cultural barrier to novelty
 - Ensure that data has been collected on actual needs by elderly, as opposed to perceived needs
 - Introduce gamification aspect to the technology (also applies to: 15)
13. Care needs to be taken with language which is used, avoiding terms like "old" or targeting to "Elderly"
 - Use phrases such as "Health ageing"
14. Inadequate penetration of mobile IT in the elderly population
15. Inadequate education/awareness amongst older population regarding the benefit of nutrition for healthy active aging
16. Inability of SMEs to reach their target customers. Elderly people are strongly influenced by their GP, who are in turn often influenced by big pharma companies. An SME has no chance against a pharma company
 - Engage with GPs and end users (older adults) in the design phase
 - Create awareness with GPs through large GP practices or GP associations

B. Resources and Regulations

17. Cost of developing evidence base for specific scientific or health claims SMEs are proposing
 - Help signpost available support (financial and other) available locally or virtually (also applies to: 18, 19, 21, 22, 25)
 - Make funding available for the building of an evidence base (also applies to: 18, 22, 23, 25)
 - Support the formation of consortia of SMEs around health claim dossier production to see if combined applications are possible



18. Conflict between commissioning work to generate incremental improvements and costs of studies for evidence base
19. Production cost controls
 - Provide scale-up support for new products through subsidised or not-for-profit facilities e.g. catapult centres in the UK (also applies to: 21)
20. Failure to raise the minimum venture capital --investors do not wish to take any risk
 - Provide or signpost 'investor-ready' workshops to prepare SMEs
 - Provide or direct SMEs towards pitching opportunities with relevant investors (also applies to: 18)
21. Lack of appropriate manufacturing capability to provide cost effective personalised products
22. Timescales. Due to the nature of health related technology, evidence gathering can often be lengthy (e.g. carrying out an RCT), which can harm an SME's ability to stay afloat and generate cash flow
 - Outsource: share cost and resources e.g. work with a University to develop a database of certified activities of nutritional principles
23. Strict Regulation – both in terms of food labelling and health claims
24. Lack of uniform regulations/approaches with respect to food provision to vulnerable older adults (e.g. dysphagia texture systems) across countries
25. Strong requirements for documentation of effects and long processing times to obtain EFSA approval of health claims can be a challenge for new PN innovations.

C. Research, Evidence, and Methods

26. Lack of SME's capacity to carry out effective user research and therefore create effective behaviour change interventions
 - Create specific multi-disciplinary SME groups (nutrition, IT, engineers) for designated research and development programmes
 - Encourage collaborative research with Universities/Institutes)
 - Provide a matchmaking service between SMEs and Researchers
 - Support the SME research through public funds and clarify the unmet needs
 - Develop linkages across the SMEs on common strategy research programs
27. Lack of understanding how, when, why and what in terms of the potential use of PN with and



without the use of genomic data

28. Lack of efficient methods for detecting specific target groups -- how are the specific nutritional needs of a person identified? (Phenotyping)
 - Collaborate with health authorities and/or experts to develop efficient and validated screening methods for nutritional needs and wants
29. The target group may be very small, and even in tests including a high number of subjects, only a few subjects will be true responders. Thus statistical power is lost even though the effect may be huge in the few responders that exist.
30. Access to patients to test effectiveness
 - Collaborate with other researchers or healthcare professionals
 - Find clinical champions to provide access
31. Depending on the specific bioactivity/health-promoting effect that the new PN innovation is anticipated to have, it may be challenging to document an effect if an objective measure does not exist.
32. Limited knowledge and science access
33. Inadequate basic knowledge among medical and public health practitioners in terms of what PN entails and its utility
 - Organise information programmes for stakeholders about advantages of Personalised Nutrition
 - Link training and increased knowledge to competencies and accreditation of public health practitioners
 - Embed Personalised Nutrition into Health Sciences education

D. Business-related

34. PN innovators have no history of commercialisation
 - Deliver entrepreneurial development skills and strategy training and incubate SMEs together (also applies to: 38, 39, 42, 43)
35. PN innovators don't know how to partner with businesses to develop products or solutions for them
 - Find companies/SMEs who have experience which Personalised Nutrition innovators are lacking and form collaborations (also applies to: 37, 39)
36. PN innovators lack knowledge regarding how to potentially license or sell IP to food producers
37. Lack of knowledge of this specific market



38. To examine the PN innovation's properties (health-promoting potential, etc), the SME may lack access to university/academia/external experts with the specific competencies needed
 - Form a personalised nutrition consortium of SMEs, Universities, and corporation by matchmaking, lobbying for policy/healthcare changes, and/or partnership grants (also applies to: 47)
39. Failure of consumers to respond to emerging market
 - Start small and iterate until consumers respond positively
40. Failure to generate an effective business model in the environment of free mobile applications
41. Market pull: Some SMEs might need convincing that there is a market/need for products which they might target at Silvers
42. Fear for the image of the company -- it is not necessarily rewarding to be interested in the elderly
43. Important to get buy-in from the retail sector – some may feel that there is no demand for this type of product
 - Collect data about the current buying behaviour of older adults to show their importance for retailers and indicate potential for growth
 - Highlight the changing population trends globally
44. Lack of joined up thinking amongst critical stakeholders
45. Conflict between traditional foods and new one
 - Make products complimentary
 - Introduce small changes in existing products used by the elderly

