A Study on the Enablers and Challenges of Co-Creation for the Digital Common Household Unit Integrated Public Service in Malta

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Abstract: Several public services in Malta operate under the stewardship of different governmental bodies, ministries, or departments. This results in considerable effort in the delivery of public services, especially ones that require the use of multiple registries, such as integrated public services (IPSs). Co-creation and co-production are increasingly being seen by public administrations as an approach toward mitigating issues stemming from such a siloed environment. Indeed, they are seen as a means to improve service provision through the delivery of citizen-centric public services that are more efficient and effective. This paper presents the Malta pilot as part of the inGOV project. The latter aims to develop and deploy a comprehensive IPS holistic framework and ICT mobile tools that will support IPS co-creation and governance. The Malta pilot focuses on modernising the Digital Common Household Unit public service. Improving considerably upon the previous ad hoc solution, the Digital Common Household Unit public service implements an iterative co-creation and co-production approach with the various stakeholders. This paper therefore presents the applied methodology in researching current challenges and enablers to the co-creation and co-production of a digital common household unit public service, with a specific focus on sustainability.

Keywords: integrated public services; co-creation; co-production; interoperability; sustainability; public service modernisation; household units

1. Introduction

Malta, as a small island in the Mediterranean, is certainly not exempt from common issues that are prevalent within public administration services globally. These include siloed datasets, non-interoperable and/or legacy systems, duplicate data, data quality issues, and organisational complexities. The fast-paced changes in technology, the changing needs of the public service users, and the advance in approaches undertaken to govern and manage public sector information (PSI) are only three aspects that have a great impact on exacerbating these challenges.

Indeed, there are an increasing number of initiatives that strive to modernise digital public services and mitigate such challenges, both at a national and a European Union (EU) level. For example, the efforts as part of the European data strategy[1] target the easier use and re-use of data through setting the required governance structures, policies, and legal frameworks, whilst Interoperable Europe[2] is an initiative that is focused on reinforcing interoperability within public administrations, aiding towards their digital transformation. The Once Only Principle[3] (OOP) initiative is another important approach towards transforming data exchange and reuse within public administrations.

An important limitation with such EU policy documents, guidelines, and roadmaps is that they do not sufficiently cater to the real-life complexity of Integrated Public Services (IPSs); integrated public services that enable stakeholders to have a single seamless experience based on their individual wants and needs. For example, documents such

as the European Interoperability Framework (EIF)[4] assume that a single public administration is in control of the various data and services needed for the provisioning of an IPS (Casiano Flores et al. 2022). Therefore, this might not be sufficient to cater to cases where there are multiple public administrations at play. Such cases are becoming more and more necessary, especially where the provisioning of IPS requires the collaboration between multiple stakeholders, including other public administrations, enterprises, non-governmental organisations (NGOs), citizens, etc. This is particularly true for solutions that aim to reap the benefits of eGovernment principles, such as the OOP, digital-by-default, interoperable-by-default, etc.

The above limitations highlight the importance of new IPS governance models, roadmaps, guidelines, business models, architectures, and information and communications technology (ICT) platforms and solutions, which are currently still lacking. Moreover, the fast-paced advances in technologies provide new and innovative opportunities for the provision of IPSs. As a means to cater to this scenario, public service co-creation and co-production are increasingly being seen as important approaches that bring significant benefits to the relevant stakeholders (Brandsen et al. 2018; Rodriguez Müller et al. 2021). Through the collaboration between public service providers and public service users throughout the development and delivery of IPSs, co-creation and co-production are seen as a way to overhaul public service provision and increase the realisation of public values, including service delivery (e.g., efficiency, effectiveness, quality, and user satisfaction), the relationship between governments, public service users, and citizens (e.g., trust, accountability, responsiveness, and transparency), and democratic quality of the service delivery process (e.g., participation, empowerment, and inclusion) (Jaspers and Steen 2019). IPS co-creation and co-production will therefore not only enable public administrations to deliver integrated, cross-cutting public service programmes (Molenveld et al. 2020), but it will also foster a co-creation culture where stakeholders, spanning businesses, non-profit organisations, citizens, and cross-domain public administration entities share the responsibility of the IPSs and are motivated and empowered to contribute towards their development.

The Inclusive Governance Models and ICT Tools for Integrated Public Service Co-Creation and Provision (inGOV) project[5] seeks to provide innovative ICT-supported governance models as well as mobile apps that will enable stakeholders' collaboration in co-producing inclusive and accessible IPSs. This research presented in this paper leverages the inGOV project to gain insight on the co-creation and co-production scenario through a specific pilot for Malta. The goal is to build upon the project models to develop a sustainable co-creation and co-production approach towards solving data silos as currently existing for the representation of Maltese household units. In fact, the inGOV Malta pilot has been selected as one of two good practices from Malta for the 2022 Berlin Declaration monitoring (Crahay et al. 2022) report (European Commission 2022), which highlights the measures taken by each Member State to reach the Policy Actions set out in the Declaration and the identification of good practices and lessons learnt. This paper therefore presents the co-creation approach and methodology undertaken within the Malta pilot towards sustainably modernising the Digital Common Household Unit public service in Malta.

Section 2 below provides an overview of the research context and presents the research question, and Section 3 discusses the relevant literature in this context. Next, Section 4 introduces the inGOV project whilst Section 5 describes the Malta pilot within this project. The next section, Section 6, describes the methodology and approach undertaken within the Malta pilot, whilst Section 7 discusses the resulting outcomes. Section 8 then provides an overview of the plans to implement the Malta pilot, and finally, Sections 9 and 10 provide a discussion on the outcome of this study and the concluding remarks.

2. Research Context

Malta is quite active with regard to digitisation efforts, particularly within the public administration. Indeed, looking at Malta's digital performance and progress on data

relative to the EU and wider, as of 2022, Malta ranked 6th out of all Member States (MS) in the Digital Economy and Society Index[6] (DESI) Country Profile Report compiled by the European Commission. In this respect, the provision of public services are given particular attention, especially since they are a prerequisite to achieving significant strategic goals, such as the OOP. Figure 1 is replicated from the report and demonstrates the Member States' ranking.
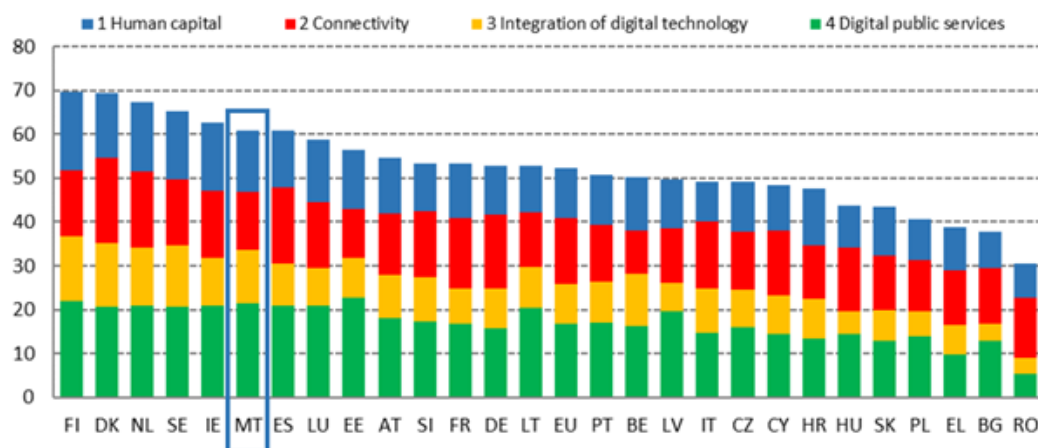
Figure 1. Digital Economy and Society (DESI) 2022 ranking.

With regard to the provision of digital public services, Malta ranks 3rd, making Malta a leader in the provision of such services to citizens and businesses, and well on the way to approach the EU Digital Decade target to achieve 100% online provision of key public services by 2030.

Unfortunately, unlike for digitisation efforts, there is not a single monitoring mechanism that is implemented with the aim of measuring the co-creation and co-production of IPSs. This makes it quite challenging to assess any change in the amount of efforts in this regard, or to compare efforts between countries. This also contributes towards the lack of information on the sustainability of such efforts.

As briefly outlined in the introduction, IPSs are becoming more and more essential in today's society, and their co-creation and co-production are vital in ensuring their effectiveness and sustainability. We therefore define the following research question to direct our approach for this research as part of the Malta pilot within the inGOV project.

What are current challenges and enablers to the co-creation and co-production of a digital common household unit public service?

The goal of this research question is to delve into the current status of the Digital Common Household Unit Public Service (hereafter referred to as the Household IPS), with a specific focus on any co-creation and co-production efforts, as well as any related challenges and enablers. This insight shall aid in the development of a sustainable roadmap for the modernisation of the Household IPS.

3. Literature Review

In this section, we provide a discussion of the literature relevant to co-creation and co-production in the context of public service provision. We start by providing a brief overview of the co-creation and co-production concepts, followed by a discussion of the literature on their application within the public administration. We then proceed to discuss the literature on household unit compositions as a basis to the IPS within the Malta pilot covered in this paper.

3.1. Co-Creation and Co-Production

Whilst facing a rising number of challenges in public service provision, such as lack of trust from citizens, fewer resources, and increasing needs, many governments are resorting to co-creation as a mitigation measure. Co-creation is considered as a means to enable the creation of innovative solutions that are more effective at meeting users' needs through shared experiences, resources, and skills (Nabatchi et al. 2017; O'Brien et al. 2016; Torfing et al. 2019; Velotti and Murphy 2020). Within the public sector, the co-creation approach requires the involvement of stakeholders throughout different phases of creation and delivery of public services (Fugini and Teimourikia 2016). Indeed, other terms are used to distinguish the different phases of public service delivery, such as co-design, co-delivery, and co-assessment (López-de Ipina et al. 2022). Moreover, the concept of co-production is often used as a synonym of co-creation (Voorberg et al. 2015); however, based on common definitions and as discussed in (Rodriguez Müller et al. 2021), co-creation can provide a more holistic and inclusive picture than co-production. For example, Brandsen and Honingh (2015) describes co-production to be a direct and active contribution of stakeholders, whilst Torfing et al. (2019) describes co-creation to be the contribution of the stakeholders towards a shared problem, challenge, or task.

3.2. Co-Creation and Co-Production within the Public Administration

In a review of public services co-creation and co-production, Rodriguez Müller et al. identify four themes behind the implementation of co-creation and co-production efforts, namely to improve public service provision, to innovate, to create new public services, and user-driven co-creation (Rodriguez Müller et al. 2021). Indeed, numerous publications in the literature cover co-creation within the public administration context. Use cases are quite common; for example, Csoba and Sipos (2022) describes a study on a pilot in Hungary, where co-creation services were used to support household economic activities in disadvantaged rural regions, McBride et al. (2019a) describes a case study on the use of open government data in co-creation, where a food safety inspection forecasting model is used to prioritise inspections at the highest risk establishments, and Edelmann et al. (2022) discusses a co-creation process within the Office of the Lower Austrian Federal Government to re-design and digitalise the Tourism Overnight Stay Tax Service that all tourist accommodations in Lower Austria are required to pay.

A number of publications also focus on best practices; for example, Gerontas et al. (2021) proposes an enhancement of the Core Public Service Vocabulary[7] by reusing classes from other core vocabularies and from the literature in order to support public service personalisation and co-creation, which supports the sustainability of such solutions within the domain. In (Casiano Flores et al. 2022), the authors build upon the EIF and propose the addition of co-creation processes within the framework, with the intention of addressing interoperability challenges.

Other publications are more focused on the research aspect. For example, McBride et al. (2019b) researches how open government data can generate public value through the co-creation of public services, and proposes a framework that structures the different parts of the co-creation cycle. Voorberg et al. (2017) focus on researching if and how state and governance traditions influence learning and policy change within a context of co-creation, where case studies from Estonia, Germany, and the Netherlands are also compared. The authors of Torfing et al. (2019) take a broader research perspective and explore co-creation within the public sector, analysing the potential risks and benefits and its potential advancement through institutional design and public leadership.

Here, it is quite interesting to note that most of the literature on co-creation focuses on the involvement of citizens as stakeholders, including in the definitions of co-creation, such as in (Brandsen and Honingh 2015; Voorberg et al. 2015). Especially in cases where there are multiple public administrations or public entities involved in the delivery of a public service, as is commonly the case in IPSs and indeed as is the case in the Malta pilot, it is vital to involve all the relevant stakeholders in the co-creation process.

Notwithstanding the large availability of literature on the domains of co-creation and co-production, there is a niche in the literature on the study of their sustainability on a long-term basis, as identified by (Rodriguez Müller et al. 2021; Sicilia et al. 2019; Voorberg et al. 2015). Especially in the context of public administration, such studies are crucial to motivate the use of co-creation and co-production and to concretely demonstrate the expected benefits of such an approach. Sustainability is therefore explicitly explored in the Malta pilot.

3.3. Household Unit Compositions

Existing literature focused on households and/or household unit compositions show that the definition of what constitutes a household can differ based on the context of the target domain that is needed for, for example, households for social security purposes based on familial relationships. In order to ensure the sustainability of the Household IPS, we here explore the relevant literature with the aim of creating an IPS that flexibly caters for all domains within the public service.

The study in (Strohschein et al. 2009) investigated the association between family structure histories and high school completion based on data from a population-based data registry for the 1984 Manitoba birth cohort. In this regard, Canadian households were based on different familial relationships, such as children born or adopted at birth into a married two-parent household, children in single-parent households, and children living in step-parent households. Similar in nature, the Japanese household registry in (White 2021) is based on the conceptual structure of Japanese family relations. Here, a shared surname and address proves a person's membership in a family which is registered in a koseki document. This document is used as evidence of family membership for social and legal purposes. Research carried out on the creation of a linked consumer register for granular demographic analysis (Lansley et al. 2019) and for estimating residential moves in the United Kingdom (van Dijk et al. 2021) define households based on the people living in the same address.

In a study about household compositions across Europe (Iacovou and Skew 2011), Iacovou and Skew define household compositions in terms of household size, that is, based on the number of people living in the same address. Examples of such household compositions are single persons living on their own, single persons living with children (minor/adult), a couple living with children, and extended families living together, e.g., two-generational households consisting of a couple plus one or more of their parents, and three-generational households consisting of a couple plus one or more of their children plus one or more of their parents. The authors in (Alves et al. 2011) built a household registry of households situated in four slums selected by the São Paulo Municipal Health Survey of 2008. Here, the households for the creation of this registry were based on identified segments (reference points established for particular slums where each segment should have around 10 households, although this varied based on the location of the respective reference points), where a comparison to a complete address list was carried out to identify the advantages and disadvantages of using segments. A study focused on identifying whether household composition is an independent risk factor for fatal unintentional injuries related to child maltreatment, basing the composition on the relationship of the adults living in the household to the deceased child (Schnitzer and Ewigman 2008). In total, five different household compositions were defined for the purposes of this study: (i) two biological parents and no other adults, (ii) one biological parent and no other adults, (iii) one or two biological parents and another adult relative, (iv) step parents or foster parents, and (v) one or two biological parents and another unrelated adult. Another study that focused on social benefits and quality of life for older adults and families, identified changes in family and social structures, e.g., geographical distances among family members couples, to support an ageing population in terms of support to older adults (Czaja and Ceruso 2022).

A healthcare-related study (Naker et al. 2020) defined a household contact as "a person who shared the same enclosed living space for 1 or more nights or for frequent or extended

periods during the day with the index case during the 3 months before commencement of the current treatment episode". This study focused on the collection of a web-based registry (e-registry) for household contacts exposed to multidrag resistant tuberculosis in Mongolia. Another health-related study (Nafilyan et al. 2021) that estimated the proportion of ethnic inequalities, explained by living in a multi-generational household, presented two different definitions of household composition. One was based on the number of adults aged 20 years, and the other was based on persons aged 65 years or over who co-resided with at least one other adult aged more than 15 years (instead of 20 years) younger.

Energy is a very popular domain, where the definition of households is carried out for various purposes, such as detecting household building energy anomalies, which might cause cost changes in the energy monthly bills (Himeur et al. 2021) and understanding how households make energy consumption decisions within a technological and institutional context, e.g., adoption of energy-efficient appliances has led to a gradual reduction in household energy use over time (Burnett and Kiesling 2022). Moreover, the study in (Abidoye et al. 2019) uses the household size as one of the most significant variables that can be used for influencing the property price in Hong Kong. Such information can also be used by the government for property-price control to make properties more affordable.

Based on the research above, our proposed model of household unit compositions goes beyond the existing state of the art, where a household unit composition within the government domain can have numerous definitions (see Section 7.4 for more information) based on the needs of certain government sub-domains, such as social security, taxation, and utility retail and supply.

4. inGOV Project

The inGOV project, a currently ongoing EU-funded Horizon 2020 project, aims to develop and deploy a comprehensive IPS holistic framework and ICT mobile tools that will support IPS co-creation and governance (Tambouris and Tarabanis 2021a, 2021b). The vision of this project is to facilitate and engage stakeholders in the co-creation and co-production of IPS with the aim of increasing IPS adoption, efficiency, and effectiveness, as well as increased trust and satisfaction from the end-users and beneficiaries. Towards this direction, the project enhances and, where needed, re-designs existing EU solutions, including the EIF, the European Interoperability Reference Architecture[8] (EIRA), and Core Vocabularies[9]. The use and extension of such solutions enable the project to focus on both the interoperability aspect as well as the sustainability of the developed solutions and project outcomes.

The results of the inGOV project will be piloted and deployed in four EU member states, as detailed below. These pilots are essential for a number of aspects, including providing evidence on the benefits of the proposed holistic framework, quantifying any increase in trust and citizen satisfaction, assessing the cultural shift towards co-creation and co-production, assessing any reduction in the administrative burden, and ensuring the sustainability of the inGOV approach.

- Austria Pilot—This pilot consists in the setting up of a governance structure that will allow for the consolidation of existing regional geo-spatial infrastructures. This will provide the basis to test IPS in areas such as tourism tax collection from 3200 accommodation providers.
- Greece Pilot—In this pilot, being carried out in the regions of Thessaly and Epirus, IPS roadmaps are used to digitalise the renewal of disability cards. Currently this involves a number of authorities and the physical presence of the applicants, affecting more than 11,500 disabled low-income citizens in just one of the two regions.
- Croatia Pilot—Carried out in the city of Bjelovar, this pilot consists in the development of a universal virtual assistant, such as a chatbot, to provide an enriched communication channel to citizens. This is particularly relevant to 32,000 adult and senior citizens, and such a platform will not only be an entry point to existing services, but also a framework on which future services would be developed and integrated.

- Malta Pilot—Affecting around 200,000 households, the Malta pilot involves the modernisation and integration of the Digital Common Household Unit public service. This involves a number of stakeholders, and will facilitate the OOP. This pilot is described in detail in Section 5.

The undertaken co-creation and co-production processes enable all the relevant stakeholders to provide feedback in a bi-directional manner, where the public service users can provide feedback to the public service providers and vice versa. This enables the stakeholders to actively participate in any decision-making processes of the IPS creation and delivery, therefore ensuring a sustainable IPS which is easy to use, understandable, factors any emerging needs within its development, and re-uses current information. Such an iterative approach increases the will for public service users to access and use the IPSs. In terms of technology, the sustainability aspect shall ensure that digital tools are updated accordingly to facilitate modern and emerging technology needs and requirements. The feedback obtained from the sustainable co-creation processes shall also be fed back in terms of recommendations to EU and national policies and best practices, thus facilitating and ensuring continuity, sustainability, and compatibility.

5. Malta Pilot—Digital Common Household Unit IPS

5.1. Motivation—Ad-Hoc Household Unit Dataset

In the Malta Government Budget 2020, it was announced that the government will issue a one-time payment to compensate for the increase in bread and milk prices registered in 2019[10], where household units of singular individuals would receive EUR 15 and household units comprising two or more individuals would receive EUR 35. This required the identification of household units, i.e., an address-based household made up of one or more members having a familial relationship. In order to deliver this public service, the public administration required to gather and process the relevant identity and address data on eligible residents and citizens of Malta. Unfortunately, these data exist in non-interoperable data silos across a number of public administration entities spanning different domains. An ad hoc task was therefore undertaken to generate a household unit dataset by integrating social security, citizen identity, and utility retail and supply records, each originating and owned by different public administration entities. The interchangeable use of data written in Maltese, English, and a mix of Maltese and English, and the use of different schemas for each dataset resulted in this task requiring a considerable logistical operation.

Whilst the above-mentioned ad hoc task served its purpose, and the public service was delivered, there are a number of shortcomings in this approach. First and foremost, the data integration task was a considerable administrative burden to carry out. In fact, this also impacted the timeliness of the delivery of this public service. Furthermore, since the data integrated within the register existed in non-interoperable data silos, the data had quality issues in terms of completeness, correctness, consistency, and accuracy, stemming from inaccuracies across the different sources. This resulted in a substantial number of eligible individuals not receiving the due one-time payment. In fact, a government customer service was set up for citizens who either felt that they did not receive the appropriate bonus, which is dependent on the number of residents in a household unit, or else did not receive the bonus at all. Any suggestions and/or complaints by citizens were manually analysed, and relevant action was taken to correct any mistake in the public service delivery. Another substantial shortcoming was the fact that this dataset is of a temporary nature, where it is not updated and maintained, thereby resulting in the dataset not providing an added value to cross-domain stakeholders for other initiatives, such as the implementation of new tax incentives, improving data maintenance and cleaning processes, improving the eligibility criteria for existing social benefits, introduction of new social benefits, effective payments of social benefits to citizens in need, and reduction of payments (social benefits or otherwise) to non-eligible citizens.

The described use case has highlighted the urgent necessity to tackle non-interoperable data silos and interoperability issues within the public administration. Towards this end, it

is vital to have the capability of extracting and defining household units in an agile manner, where information from various entities will be used in line with specific requirements for the provision of public services as required.

5.2. Main Goals

In order to tackle the above-mentioned limitations of the ad hoc approach, the Malta pilot seeks to exploit the co-creation roadmaps, guidelines, governance models, and tools that will be developed in the framework of inGOV to modernise and integrate the Digital Common Household Unit public service. The Malta Information Technology Agency[11] (MITA), responsible for the Malta pilot, has the goal to provide an effective IPS that offers the capability to extract and define household units in an agile and efficient manner. This requires the creation of an IPS through the development and co-creation of a common register that integrates the taxation, social security, citizen identity, and utility retail and supply datasets that are currently siloed. This IPS shall be used to identify unique household units, which are currently relevant to the provision of a number of public services, including to determine all social security and taxation entitlements being consumed by each family. Here, it is worth noting that citizens and residents of Malta, amounting to around 200,000 households made up of approximately 0.5 million individuals, are not directly involved stakeholders (not service users) but are the end-beneficiaries of the Household IPS. Through this register, the IPS will then enable stakeholders to exploit the relevant data as required. This IPS will also contribute towards achieving OOP goals through the sharing and re-use of data between public entities.

With the aim of achieving the above-mentioned goals, as well as to answer the research question defined in Section 2, a methodology was devised to ensure a structured approach towards co-creation for the Malta pilot. This methodology, covered in the next sections, involves (i) the elicitation of requirements from the stakeholders, (ii) the analysis of the results, and (iii) the adoption and implementation of the insight gained during the previous two tasks. Note that since inGOV is currently ongoing as a project, the final task is still a work in progress.

6. Requirements Elicitation Process

The elicitation of requirements for the household register within the Household IPS consisted in carrying out sessions in the form of focus groups with the relevant stakeholders, with the goal of identifying stakeholder needs. These sessions were based on a questionnaire that was prepared specifically for the elicitation of requirements for the Malta pilot.

6.1. Focus Group Sessions

The goal of the focus group sessions was to identify the stakeholder needs for the development of the Household IPS for the Malta pilot, as well as identifying existing challenges and enablers of co-creation in this context. These sessions were based on a questionnaire (more information in the next section) that was prepared specifically for the elicitation of requirements for the Malta pilot. Moreover, a questionnaire protocol was created as part of the inGOV project to provide guidelines and a standard process and template for the focus group sessions (e.g., a code is used for anonymously identifying each respondent/answered questionnaire sheet) and the respective questionnaire prepared.

Initially, the prepared questionnaire was sent via e-mail to the invited participants together with consent forms in order for the respondents to get a good idea of the topic and questions prior to the focus group sessions. The consent forms provided all relevant information on the participation in the focus groups as well as information on the processing of personal information, and asked for the respondent's name and contact details; the personal information was not included in the questionnaires. In this regard, only a code was included as the identifying element of the respondent and as the linking element between the questionnaire and the consent form. This process ensured that the pseudonymised

forms can be shared within the project consortium, whilst the personal details were retained and used only within the team working on the project within MITA. Before the focus group sessions were organised and initiated, it was ensured that all signed consent forms were gathered from the all respondents.

In order to provide context to the participants, before each focus group, an information session was also held. A total of 6 focus groups were then held, one per domain as shown in Table 1. Depending on the type of stakeholder, the focus group sessions consisted in responding to a specific set of questions targeting service providers and users, IT service providers, and policy makers respectively. Due to the nature of the participating entities, as public administrations, the stakeholder types of the interviewees were usually of the same nature, so each interview generally consisted of the same type of stakeholders.

Each focus group session lasted, on average, around 60 min. These were carried out remotely (due to national COVID-19 measures at the time) and were recorded for future clarification where needed.

Table 1. Overview of participants in focus groups.

Domain	Entity	Stakeholder Type	No. of Participants
Taxation	Ministry for Finance and Employment (MFE)/ Commissioner for Revenue (CfR)	Service User, Service Provider	1
	MITA Taxation Team	Service Provider	4
Social Security	Ministry for Social Justice and Solidarity, Family and Children's Rights (MSFC)	Service User, Service Provider	5
	MITA Social Security Team	Service Provider	1
Citizen	Identity Malta (IMA)	Service User, Service Provider	2
	MITA Identity Team	Service Provider	2
Utility Retail and Supply	Automated Revenue Management Services (ARMS)	Service User, Service Provider	1
National Statistics	National Statistics Office (NSO)	Service User	3
Members of Parliament/Ministries	Office of the Prime Minister (OPM)	Service User (for decision making)	3

6.2. Questionnaires

The questionnaire was first drafted at a project level as a template, where the questions, separated in different sections, were formulated based on existing co-creation best practices and guidelines, such as those in key EU eGovernment initiatives and policies, such as the EIF, and the 2016–2020 EU eGovernment Action plan[12]. Given that the end users for the Malta pilot are not the citizens (who are the end beneficiaries) but the service users, the Malta pilot questionnaire differed from the ones applicable for the other pilots; hence, the generic template questionnaire prepared for the inGOV pilots was adapted to cater to the Malta pilot needs. For instance, some questions were reformulated to address the specific stakeholder categories of service users and service providers.

The questions focus on several themes and topics related to the Malta pilot (to identify the high-level user requirements), namely, the user expectations and experiences with the public service, including the definition of user stories as a way of eliciting user needs, the stakeholders' opinion on the co-creation aspect, IPS, and IPS governance, the stakeholders' opinion on aspects of the different EIF layers, i.e., legal, organisational, semantic, and technical, and the sustainability of the proposed IPS within inGOV and thereafter.

Given that the aim of the stakeholder focus groups was to involve all different stakeholders identified for such a purpose, i.e., service providers, service users, and policy makers, certain questions had to be adapted accordingly to the respective stakeholder group since not all aspects were relevant to all. In this regard, two different questionnaires were prepared: one for the public officers (service providers, service users) and one for the policy makers. The public officers questionnaire[13] was composed of four sections: (1) public

officer role questions, (2) household unit public service questions, (3) technical questions (for IT service providers), and (4) generic inGOV project questions. The questionnaire for the policy makers[14] was composed of two sections: (1) policy makers' questions, and (2) household unit public service/IPS questions.

It is important to note that the questionnaires and the consent forms mentioned previously both followed a thorough ethical review process before they were approved for use within the focus group sessions. Initially, they were discussed and reviewed by the MITA Ethics Committee. The purpose of this committee is to provide ethical oversight through guidance, support, and recommendations on ethical best practices and compliance with data protection legislation. The documents were then reviewed by the inGOV Ethics Manager, where the feedback and any changes required were carried out before they were approved for actual use within the focus group sessions.

6.3. Stakeholder Selection Process

As a vital aspect of the Malta pilot, as well as the inGOV project, the methodology to implement the Household IPS has a strong co-creation and co-production basis. The methodology taken in this study therefore requires the identification of stakeholders to participate in the co-creation process. Towards this aim, the relevant stakeholders were identified and categorised as follows:

- Service provider: providers of an IPS, including IT service providers, private entities/businesses, and public administration entities;
- Service user: end user of an IPS, which includes different governmental bodies, ministries, or departments (business owners);
- End-beneficiaries: citizens or residents of Malta who benefit from an IPS, such as receivers of social benefits.

Here, in the case of the Malta pilot, it is quite important to note that the citizens are not the service users, as is commonly the case with IPSs co-creation efforts. The service users are instead the public administration entities.

As described in Section 5.1, the current service operates through the merging of multiple siloed and non-interoperable datasets owned by different governmental bodies, ministries, or departments, containing the following data:

- Social security records;
- Citizen identity records;
- Utility retail and supply records.

The stakeholders involved in this public service include the respective government entities who own the above-mentioned datasets relevant to the family household, as shown in Table 1: The variety in domains between these stakeholders in fact highlights the applicability of the Household IPS, where use cases include the following:

- Improving data maintenance and cleaning processes;
- Implementing new tax incentives;
- Improving eligibility criteria for existing social benefits;
- Effective payment of social benefits to citizens and residents in need;
- Reducing payments to non-eligible citizens and residents.

The selection process of the relevant stakeholders chosen for the focus group sessions ensured that a purposeful sample of participants was identified and selected based on certain principles, such as knowledge and experience in the domain of interest (household unit compositions), availability and willingness to participate, and the ability to communicate their experiences and opinions in a clear, expressive, and reflective manner (Palinkas et al. 2015).

The selection process for the participants in the study therefore involved contacting and inviting service users and service providers. These included public officers and policy makers, who are currently working in entities within the government data governance,

taxation, social security, citizen identity, utility retail and supply, and national statistics domains, and are actively using the various resources, databases, and/or services to be used in providing the new IPS. The stakeholders were also selected based on their involvement level and expertise. Sessions were then organised based on the participants' consent to participate in the aforementioned sessions.

A number of eligibility criteria were also defined for the participants as follows:

- Target age: Minimum 18 years, no maximum age.
- Target gender: Diverse.
- Inclusion of children and/or vulnerable persons: No children or vulnerable persons were included in the study. Participants were all able to give their consent personally.

7. Analysis

This section provides an analysis of the results of the focus group elicitation sessions described in Section 6. In the following subsections we discuss the participants' perspective on co-creation and IPSs and their governance, the different household definitions as used in the various stakeholders' domains, existing issues and challenges in the current household service, and a discussion on sustainability aspects and challenges.

7.1. Participant Overview

As detailed in Section 6.3, three types of stakeholders were identified for the Malta pilot. Since the Household IPS is not intended to be used by citizens and residents of Malta, this stakeholder type was not considered for participating in the focus groups. Therefore, the resulting stakeholders were a mix of service providers and service users, as shown in Table 1. In fact, a number of stakeholders were actually both service providers, in that they were involved in the collecting and processing of the required data, and also service users, in that they used these data to provide a public service. On the other hand, IT service providers assisted the service providers on the technical delivery of the service. Within IT service providers, the roles varied between consultants, project managers, enterprise architects, and heads of departments, whilst for the service users, the roles included data protection officers, legal officers, heads, directors, and chief information officers. The roles for policy makers, as service users, consisted of chief information officers and heads of unit.

7.2. Co-Creation Aspects

Whilst the participants in the interviews or focus groups were not familiar with co-creation as a term, they were indeed familiar with its concept and practice. In fact, particularly the IT service providers have always engaged with the relevant stakeholders, including service users and other service providers, in the co-creation of services. The interviewees described various instances of co-creation, where the stakeholders were involved throughout the creation of new services. Whilst not always applicable, citizens were also sometimes involved in the co-creation process through the carrying out of pilots or workshops (serving different needs, such as requirements elicitation, software validation, etc.). In certain cases, individuals from the service providers evaluated the system on behalf of citizens as service users, e.g., to ensure that the service is user-friendly and easily accessible.

In all cases of co-creation, the requirements for data provision (including compliance to relevant legislation), as well as technical requirements, are considered within the co-creation process based on the project in question and type of collaboration. In the case of participants working in the National Statistics domain, they participate in the co-creation of services only as an end user; however, certain data-sharing requirements are mandated by legislation, so the capturing of these requirements is enforced.

In general, the implementation level and data level were identified by most interviewees as being the aspects that proved to be the most challenging, particularly due to the siloed nature of the registers and the lack of communication and coordination between the stakeholders. This was found to be especially challenging when there was the need for ad

hoc collaborations and data sharing. In all cases, the OOP and one-stop-shop concept were shown to be common goals between the stakeholders.

7.3. IPS and IPS Governance

Similar to the co-creation concept, the participants were not familiar with the "Integrated Public Services" as a term; however, they had collaborated with other stakeholders in providing IPSs.

Due to the dependencies on third-party sources, a number of interviewees identified the need of a governing body to manage the coordination and data sharing, as well as the maintenance of data and the use of standards, and to manage any funding available for the delivery of the service in question. This would also contribute towards solving the issue of discrepancies in data between different registers, through the establishment of a "ground truth" base register. A number of interviewees, in the context of the delivery of IPSs, pointed out that interoperable data sharing and reuse is crucial, particularly as enabled through the use of standards and specifications such as the use of core vocabularies and application programming interfaces (APIs).

7.4. Household Unit Definitions

A vital point which was raised in the sessions is that the different business domains have different definitions of household compositions. For instance, for the utility retail and supply domain, who manage water and electricity consumption, a household is defined as one or more persons residing in an address. It does not matter if the individuals have any relationships, whether familial or otherwise. On the other hand, the social security domain has different household definitions based on familial relationships. For example, two parents and two children as a family are defined as a household. In the case of this domain however, multiple forms of households exist to cater to the real-life complexity. In fact, another example of a household is when two siblings live together. In certain cases, there might also be multiple households living in the same address. In some cases, such as in the taxation domain, no official household definition is available; however, the identification of households for certain services, such as identifying cohabiting couples for calculating tax and respective applicable tax rates, is still needed.

In light of the various definitions of household units, stakeholders from different business domains noted that a "one-size-fits-all" approach might not be ideal, as it would put at risk the operation of tasks within different entities that have different definitions of household units. Additionally, the exposure and alignment of the different definitions and applications of household units would aid in mitigating the issues stemming from the existence of the various definitions of household unit compositions, even within the same entity or stakeholder. The ideal Household IPS should thus provide a single interface, where all household unit compositions can be accessed.

7.5. Current Issues and Additional Feedback

The various household definitions mentioned above also brought up a relevant issue related to the siloed state of the registers, whereby the multiple registers storing information related to household units might hold different values for the same field (e.g., address) as is relevant for the particular stakeholder. This creates discrepancies in the data when merged together to obtain the household unit information, therefore resulting in quality issues, such as lack of reliability and information that is not accurate.

Another problem that was frequently brought up during the interviews was the lack of coordination between the relevant stakeholders who own the datasets across the multiple business domains. This is mostly evident where data requests by service users are made on an ad hoc basis. Such a task makes it very labour-intensive to integrate the data, as it has to be done manually or via the use of rudimentary basic data matching techniques. The dependencies between the systems in question further complicate the situation. This is

especially problematic where data which are not validated are re-used in other systems, therefore propagating data with quality issues.

With respect to the silos and lack of coordination issues, the participants all indicated their desire for better coordination between the stakeholders, including on a legal dimension, as well as the connection and/or integration of the registers, where any changes in one system would be automatically propagated to the rest. This integration effort was also seen as an opportunity to better represent the real-life household complexities and also to extract new information from existing data. Examples include exposing individuals who provide non-accurate data to abuse certain services, such as social services that they might otherwise not be eligible for, or possibly identifying humanitarian cases in order to provide social assistance.

An interesting point raised by a couple of stakeholders was the possibility of exposing at least some of the information stored by the various systems to the citizen as the end beneficiary. In this way, the citizen and/or resident can validate the existing information and correct any details. In this case, the legal implications would need to be thoroughly evaluated.

The policy makers specifically mentioned that the proposed Household IPS can be beneficial in enabling the implementation of the Citizen Twin concept[15] being proposed at a government level. This concept aims to build a repository for holding all public data stored by the government about an individual throughout their lifetime. This opposes the current approach utilised by most of the entities, whereby each have their own separate repositories for storing data.

Moreover, the interviewees listed multiple use cases of how the Household IPS can be used and where it can prove to be beneficial, with the following ones being the most relevant:

- Identification of double registrants for tariff subsidies/rebates;
- Identification of correct and reliable residential information for official mailing purposes;
- Investigation purposes, such as social benefit compliance and identification of unregistered taxpayers;
- Improvement of data maintenance and cleaning processes for validation and verification purposes (for entities in the public and private sector based on their needs);
- Health emergency services;
- For the provision of services by the private sector (e.g., for insurance purposes).

7.6. Legal, Organisational, Semantic, and Technical Aspects

Based on the questionnaire used in the focus groups, a number of questions were aimed at the legal, organisational, semantic, and technical aspects, following the EIF layers.

7.6.1. Legal Aspects

A very important point that was raised here is the need for a legal basis when stakeholders require the sharing of data between them. In such cases, the relevant agreements, such as data-sharing agreements and memoranda of understanding, need to be set up. Here, some interviewees noted a gap in legislation, where some stakeholders, such as third-party users, are not obliged or enforced to update relevant registers with changes made on their end. In most instances, this obligation currently rests on citizens, who have the responsibility to separately contact all relevant entities and update the relevant information. This issue results in outdated information and discrepancies in a number of datasets. Interviewees all note that in all instances of IPS delivery, the data owners and stakeholders or contributors should be identified, and their roles clearly defined. Preferably, the legal basis for the household unit register should define the relevant roles and cater for any required data sharing, including any obligations, what specific data should be shared, and when. This would avoid the need to set up separate agreements or legal documents on an ad hoc basis, which requires substantial effort and overhead.

Related to the above, policies and or legislation should be appropriately defined to cater to real-life complexities and align the requirements for the collected information. This would cater to issues stemming from inconsistencies, such as use of different identification documents (e.g., ID cards vs. passport documents), and nature of address provided (e.g., personal residence vs. address of representative such as an accountant, or address of a holiday residence).

7.6.2. Organisational Aspects

Regarding the organisational aspects, and as already mentioned, a frequent problem identified by most of the interviewees was the lack of coordination between the relevant stakeholders who own the datasets. This issue is further exacerbated by the dependencies between systems and the services offered by the stakeholders, and also by the lack of clear definition of the roles and responsibilities of all stakeholders with respect to the service in question.

7.6.3. Semantic Aspects

Regarding the semantic aspects, the major challenge identified by all interviewees is the different definitions and representations of household units. Whilst this does not directly affect data exchange, the IPS is affected through the resulting discrepancies in household unit representations. Another challenge, stemming through the lack of a base register for Maltese addresses, is the inconsistency in representation of addresses by the different stakeholders since they would have different representations and/or references for the same address or parts of it, such as the post code. The address base register, which is part of an ongoing modernisation project, will aid in this regard. Another issue here is when individuals do not use the correct address in certain systems. For example, when for taxation purposes individuals provide their accountants' address for direct correspondence (for mailing purposes), as opposed to their personal address, or when a holiday residence address is provided instead of the permanent residence.

7.6.4. Technical Aspects

Regarding the technical aspects, the siloed nature of the different registers and the lack of coordination between stakeholders result in a number of technical challenges in the provision of public services in Malta. A major issue is the ongoing use of legacy systems, which of course result in interoperability issues. Although there are ongoing modernisation efforts, the interviewees are still experiencing issues with data integration, and in most cases, this process is still being performed manually through the use of data files. An important aspect that emerged from the interviews is the dependencies between systems and/or registers. If there are any dependencies between the Household IPS and other registers or systems, they might affect or hinder any updating or modernising efforts. For example, if the dependent system is a legacy system, the Household IPS might not be modernised as required, as this would result in the said systems not being interoperable due to compatibility issues.

The issue of legacy and non-interoperable systems also means that currently there is no automatic propagation of changes between the systems, which of course results in data that are not up to date and therefore not reliable or accurate. In these cases, the use of APIs would be a solution to mitigate this challenge, even though in certain cases, they would need to be created ad hoc to cater to the specific requirements at hand. Moreover, in the context of the Household IPS, some participants pointed out that there should be the identification of events (e.g., life events, such as birth, marriage, and death) which would trigger an update to the relevant registers. In the case of discrepancies, these should be flagged to the appropriate stakeholder and addressed.

From the technical aspect of registers and systems relevant to the Household IPS, most participants also identified a number of data quality issues that need to be tackled. First of all, relevant systems use different languages (Maltese, English, and mix of Maltese and

English—known as Maltese–English). The use of the Maltese language was encouraged through the availability of Maltese characters on local systems, introduced in December of 2020[16]; however, especially in cases of non-Maltese names, there are still issues with representing other characters. Other important data quality issues include incompleteness and incorrectness of data, and syntactic errors, sometimes stemming from lack of validation measures.

8. Implementation Details

Following the information and feedback gathered in the requirements elicitation process and their analysis discussed in Sections 6 and 7, we here discuss the implementation aspects of the Household IPS, with a particular focus on sustainability.

With respect to the sustainability of the IPS implementation, the integration of the different registers, including the automatic propagation of changes, is very important. This would enable the relevant registers to be up to date and stay relevant. Better coordination and communication between stakeholders, as well as the definition of appropriate legislation, and establishing a governing body, would also help in this regard. On a related note, the establishment of a "ground truth" base register to act as a gold standard would help mitigate any discrepancy issues between the various registers contributing to the IPS. Otherwise, if relevant systems cannot be integrated, at least the information can be linked, therefore mitigating any issues stemming from siloed data sources.

The sustainable management of implementing changes or system updates, especially in case of dependencies between systems, is also a very important factor. In such cases, communication is essential to identify any impact of changes or enhancements, and the latter should be thoroughly evaluated before being implemented.

Regarding the technical aspect in context of the sustainability of the Household IPS, the accuracy, completeness, and correctness of the data should also be kept in mind. In this regard, the standardisation of fields across data sources and multiple business domain and respective stakeholders acting as data owners would be helpful. The interoperability between systems and data sources is vital for a sustainable implementation of the IPS. Moreover, the availability of skills for the maintenance of the developed IPS are also important for its sustainable implementation.

The implemented technology is also vital for the sustainability of the IPS, where the IPS needs to be current and agile, and needs to be updated on a regular basis. Moreover, dependencies between systems and services will affect their updating and/or modernisation. The use of knowledge graphs will be used for representing the household unit data, since they provide several benefits, such as the following:

- Flexible representation of heterogeneous data;
- Enables advanced visualisations of the various household unit definitions that can be available within the data whilst hiding underlying complexity;
- Simpler maintenance, mitigating challenges stemming from data silos;
- New information (e.g., family tree identification) can be extracted from existing data through the linkage of datasets;
- Enables higher-quality analysis at a household level, e.g., to identify double registrants for tariff subsidies/rebates (utility retail and supply), "usual residence" in census (national statistics), and investigation purposes (taxation, and social security);
- Enables innovation based on artificial intelligence using techniques such as machine learning and deep learning for multiple use cases, such as automatic detection of social benefit eligibility and automatic flagging of potential tax evaders;
- Is in line with European Interoperability Framework and the ISA^2 Action 2016.28 'Access to Base Registries' (ABR) recommendations and the OOP.

Ownership of the household unit register should be determined for the IPS to be sustainably delivered. Most of the entities interviewed were both service users and service providers (e.g., stakeholders within the social security and utility retail and supply domains). However, ownership of the household unit register can also be claimed by entities

that are solely service users. Responsibilities of all the involved stakeholders should be clearly defined, and a legal basis needs to be established for all data processing required, including data collection and data sharing.

The following is a list of the main user requirements for the Household IPS as derived from the requirements elicitation sessions (refer to Section 6):

- Usability: ability to view, query, and represent different household compositions, e.g., familial relationships-based and address-based (through different advanced visualisations), and categorise household units according to different criteria through a simple and easy-to-use user interface;
- Interoperability: expose all functionality of the IPS via REST APIs to enable interoperability with other systems within public administrations, especially systems where source household data need to be extracted;
- Integration: integrate data from multiple entities who agree to participate in the Malta pilot, and later on integrate data from the National Person and Address base registers when they are made available (currently a work in progress);
- Compliance: use of established standards and specifications such as core vocabularies and APIs, compliance with GDPR, and ensuring that the household unit register has a legal basis for data collection, sharing, and processing;
- Data integrity: address data inconsistencies, i.e., registers holding different values for the same field, and records in different languages;
- Security and Privacy: public administration access control (user authentication and authorisation).

Figure 2 provides a high-level architecture of the Household IPS, which shall be hosted on the Government of Malta Hybrid Cloud Platform[17]. This IPS shall offer the visualisation of different household unit compositions, which shall be represented as a knowledge graph. The knowledge graph is an integration of different data sources from multiple stakeholders spanning different business domains, such as social security, taxation, and utility retail and supply. The knowledge graph is aligned with existing vocabularies such as core vocabularies, including the core person vocabulary[18] and the core location vocabulary[19]. Service users, i.e., public officers, will use the Household IPS service in order to deliver better public services to the end beneficiaries, i.e., the citizens and residents of Malta.
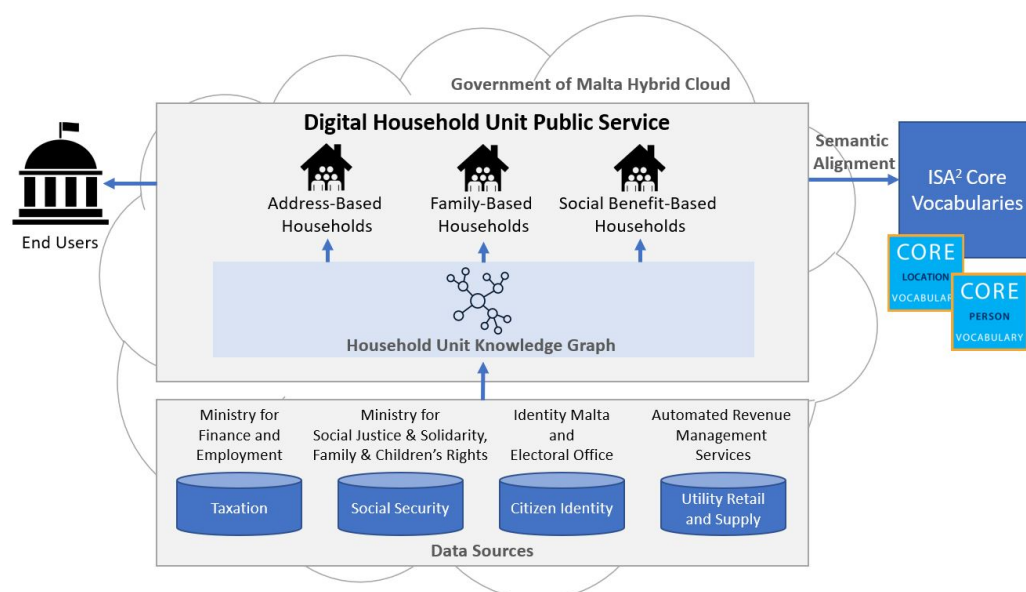
Figure 2. Digital common household unit IPS high-level architecture.

8.1. Usage Scenarios

This section presents two usage scenarios for the Malta pilot based on input from the interviews carried out for the requirements analysis phase. The usage scenarios refer to the envisaged situation of the Household IPS. These consist of user-centric stories which describe the planned goal to be achieved, the user interactions with the IPS, and the expected usage of the IPS.

8.1.1. Usage Scenario 1—Identification of Household Units Based on Residence

Involved stakeholders (and types): Nina, a Project Manager working with the Ministry for Finance and Employment (service user).

Background and goal: The Government of Malta has promised a one-off bonus to household units to boost the economy in the aftermath of the COVID-19 pandemic. The number of persons in each household unit determines whether a EUR 15 (single persons) or a EUR 35 bonus is given (household units with more than one person). Nina has been tasked with identifying Maltese household units and the number of people in each household unit so that the appropriate bonus amount is issued per household.

Scenario: Having the necessary legal basis for the processing of household data in place, Nina can authenticate to the Household IPS and is able to query the system based on the authorisation access levels provided. Nina selects the composition of a household that is appropriate to this use case, i.e., an address-based household, and queries the household unit register for the required information, i.e., identifying the household units based on residency, and the number of people living in each address. Other query options are also available, for example, familial households (i.e., made up of family members). The complexity of the data integration is hidden from Nina, who is provided with a simple and intuitive interface which requires only minimal domain knowledge to operate. Nina then selects the appropriate categorisation of households, e.g., categorisation to single individual households and multi-person households, in order for a bonus of the appropriate value to be issued to each relevant address accordingly and be sent through traditional mail.

8.1.2. Usage Scenario 2—Identification of Household Units Based on Familial Relationship

Involved stakeholders (and types): Michael, a Director working with the Ministry for Social Policy and Children's Rights (service user).

Background and goal: Children's Allowance is awarded to married couples, civil union couples, cohabiting couples, single parents, separated parents, or returned migrants, having the care and custody of their children under 16 years of age. Parents are eligible to receive Children's Allowance for all children. Hence, if a beneficiary is receiving Children's Allowance, upon birth or adoption of a child, the Children's Allowance claim and payment will be updated automatically. The Children's Allowance rate is based on the household income 2 years prior to the claim and/or revision of claim. In order to deliver this social benefit accurately, Michael needs to identify the household members in every household unit and determine their eligibility.

Scenario: Having the necessary legal basis for the processing of household data in place, Michael can authenticate to the Household IPS and is able to query the system based on the authorisation access levels provided. Michael selects the composition of a household that is appropriate to this use case, i.e., a familial relationships-based household, and queries the household unit register for the required information, i.e., identifying the members of the household units based on familial relationships. Other query options are also available, for example, households based on residence. The complexity of the data integration is hidden from Michael, who is provided with a simple and intuitive interface which requires only minimal domain knowledge to operate. Based on the eligibility criteria, Michael can use the Household IPS to categorise the household units according to the eligible children's allowance rates in order to deliver the children's allowance to the respective identified household units.

9. Discussion

The research carried out in this study, whilst it is not a long-term study on the sustainability of co-creation, has still provided invaluable insight on current challenges and enablers to co-creation and co-production, in context of the Household IPS in Malta. The focus groups with the various stakeholder types have shed light on a diverse set of aspects that directly impact the delivery of public services in Malta.

Quite importantly, the participants indicated that co-creation is quite a wide-spread practice within the Maltese public administration. Indeed, co-creation approaches are considered to be a means to develop and deliver public services in a sustainable manner. However, there were two major challenges that the participants identified as aspects that hinder co-creation, namely, the lack of an appropriate legislative framework that caters for the governance of data, and a lack of coordination between the relevant stakeholders. These are indeed substantial challenges that need a long-term roadmap at a public administration level. If co-creation and co-production are to be established as a sustainable collaboration between stakeholders, a proper framework needs to provide structure and guidance towards such efforts, facilitating and encouraging interaction between the public administration and public service users and beneficiaries.

Here, it is worth noting that whilst the context of this study is the Household IPS, most of the identified challenges and enablers are applicable across the public administration. Yet, consideration must also be given to scenarios where citizens are also stakeholders, and therefore need to be involved in co-creation efforts.

10. Conclusions

Globally, governments are understanding the importance of improving their service provision in order to be more citizen-centric. Co-creation and co-production are becoming more and more integrated into the process of developing and delivering such services, where the relevant stakeholders are involved throughout, with the aim of achieving more effective and efficient public services that are also sustainable.

The inGOV project, presented in this paper, embraces co-creation and co-production and sets them as the basis to facilitate and engage stakeholders for the creation of IPSs, with the aim of increasing IPS adoption, efficiency, and effectiveness, as well as increased trust and satisfaction from the service users and end beneficiaries. The Malta pilot, exploiting the co-creation roadmaps, guidelines, governance models, and tools that are being developed in the framework of inGOV, focuses on modernising the Digital Common Household Unit public service. The goal is to have a Digital Common Household Unit public service that enables stakeholders from various domains to identify unique household units in Malta as well as the different household compositions (e.g., familial and residential).

As the major contribution in this paper, the methodology of researching the current challenges and enablers to the co-creation and co-production of a digital common household unit public service is presented. This paper therefore provides an overview of the co-creation requirements elicitation process, discusses an analysis of the outcome, and puts forward the IPS implementation details, whilst consistently focusing on the sustainability aspect.

Having the sustainability of the IPS set as a major priority of the Malta pilot, the results of the co-creation requirements elicitation process are currently being used for the next steps of creating the Household IPS. The long-term vision for the Malta pilot is indeed to solve or at least mitigate existing issues that hinder such a service from being sustainable, as is the case with the current ad hoc state of the service. In fact, important outcomes of this study include a number of challenges that stem from the current siloed state of both the data and the organisations of the stakeholders.

Ultimately, beyond the scope of the Malta pilot, the end goal is to narrow the gap between stakeholders of public services, whether the stakeholders are public administration entities or citizens and/or residents of Malta. Even though in this case the citizens and/or residents of Malta are not the service users, they will directly benefit from a more efficient

and effective public service as end beneficiaries. Moreover, the engagement of the service users through the co-creation and co-production processes will allow the IPS to not only cater better for their specific requirements, easing the administrative burden, but will also aid in the building of trust between all involved stakeholders through working together towards a common goal.

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