# **Executive Summary (GS1 Netherlands Focus)**

GS1 Nederland is “het kennisplatform en dé serviceorganisatie voor het uitwisselen van productdata” . With ~100 staff, it issues GS1 identifiers (GTIN/EAN, GLN, SSCC) and supports Dutch businesses in using them for supply-chain efficiency and regulatory compliance. Key services include membership onboarding (code provisioning, account management via MijnGS1), sector-specific data services (e.g. GS1 Data Source for GDSN synchronization, GS1 EDI), standards guidance, and training. Notably, GS1 NL co‑develops data models and tools with industry (retailers, manufacturers, healthcare providers) . For example, in retail it facilitates sharing Nutri-Score data and product traceability via its GDSN datapool , while in healthcare it drives projects like GS1 Data Care to improve medical-device data quality .

ISA design recommendations: An intelligent assistant for GS1 NL should be Dutch‑language, integrate GS1 NL knowledge and global standards, and support sector rules. It should retrieve information from the GS1 NL Knowledge Base and datapools (e.g. GS1 Data Source) to answer questions, with full traceability. For example, the ISA could explain how to comply with the Dutch Landelijk Implantaten Register (LIR) by generating a UDI and uploading device data via GS1 Data Source . It should support interactive use (chatbot/FAQ style) and structured queries (e.g. “does product X meet MDR/UDI requirements?”). By combining an LLM with a GS1‑specific knowledge graph (citing standards and local regulations), the system can reason over both free-text and formal rules .

Key findings: GS1 NL is highly focused on data quality and compliance in Dutch contexts (e.g. MDR/UDI, Circular Economy laws) . Many companies lack complete data for regulatory reporting; GS1 NL’s Data Care program tackles this by pushing data into GDSN . Communication gaps exist between global GS1 updates and local practice. Therefore, the ISA should continuously ingest GS1 NL content (news, KB, webinars) and global alerts, translating or contextualizing as needed.

# **GS1 Netherlands Functional Map**

* Unique Identification & Onboarding: GS1 NL assigns and manages company prefixes and GS1 keys (GTIN, GLN, SSCC, QR). Firms “bestellen artikelcodes” via MijnGS1, choosing Base or Premium packages. Tariffs and renewals are tiered by company revenue . Account admin (billing, turnover proofing, contract changes) is handled through the MijnGS1 portal, with support for PO numbers and contract terminations .
* Data Services & Quality Programs: A core function is operating GS1 Data Source, the Dutch GDSN-certified datapool. Suppliers in retail and healthcare load product data (nutritional info, UDI data, sustainability attributes) into GS1 Data Source for automatic syncing with customers. GS1 NL runs sector data-quality programs (e.g. for food/drugstore and for medical devices) to enrich GDSN data . For instance, the Data Care program encourages hospitals and device makers to populate all required UDI fields and digital documents (certificates, IFUs) in GDSN .
* Standards Support & Consulting: GS1 NL advises members on GS1 standards adoption. This includes guidance on barcoding (EAN/UPC, DataMatrix, GS1-128) and advanced identifiers (QR Code, Digital Link). It provides sector-specific coding rules (e.g. Dutch vet-to-table (Diergezondheidswet) or medical UDI requirements). GS1 NL maintains working groups with manufacturers, retailers, and care providers to refine local data models . Implementation Partners (hardware vendors, system integrators, consultants) are engaged to assist members with on-site barcode and database integration .
* Training & Education: GS1 NL offers workshops, webinars and documentation. Topics range from “Kennismaken met barcodes” and EDI tutorials to sector courses (e.g. “MDR/UDI en Basic UDI-DI” ). A publicly accessible Kennisbank covers common tasks (barcode generation, control digit, GDSN usage) . For example, GS1 provides videos on using GS1 Data Source, and a QR Code vs “QR Code powered by GS1” primer . Customer support (phone/email) backs the KB: “In deze kennisbank staat alles wat je nodig hebt… Kom je er niet uit? Bel dan onze customer support” .
* Sector Coordination – Retail & DIY: In the food/drugstore sector, GS1 NL works on supply-chain efficiency and regulatory compliance. They engage retailers and suppliers in topics like sustainability labeling, packaging data, and the QR Code powered by GS1 for consumer engagement . For example, GS1 NL helped Dutch food companies integrate Nutri-Score data into GDSN for the national food database . In DIY and construction, similar efforts focus on tracking, quality labels, and government logistics requirements.
* Sector Coordination – Healthcare: GS1 NL emphasizes patient safety and traceability. Barcodes on medicine and devices enable automated recording in clinical systems. GS1 NL collaborates with hospitals and authorities on UDI compliance (MDR/IVDR) and the implant registry. Dutch law mandates that implantable devices use GS1 UDI and share data via GDSN . GS1 NL provides tools to “maken en gebruiken” GS1’s Unique Device Identification . They also coordinate the national Uniforme Dataset for medical devices – a standardized GDSN template agreed with professional bodies to include fields like sterilization info and digital documentation . GS1 NL’s healthcare team works with the Landelijk Implantaten Register (LIR), advising suppliers how to upload device data to both hospitals and LIR via GS1 Data Source .

Image: In retail, GS1 identifiers (e.g. QR codes) enable consumers to scan products (e.g. produce) and access rich data. GS1 NL supports this with Data Source, QR Code, and Digital Link services .

Image: In healthcare, GS1 barcodes (e.g. on implants or medicines) allow clinicians to scan products for patient safety and regulatory compliance. GS1 NL’s programs (UDI, GDSN) ensure the right data flows.

# **GS1 Netherlands Activity & Responsibility Matrix**

* Daily Operations (Customer Support & Admin): The support desk fields calls/emails on barcode generation, membership, and portal issues. Support staff triage queries (e.g. “Why is my UDI invalid?”) and update the knowledge base. IT/admin teams run the MijnGS1 portal and invoicing (renew contracts on Jan 1 each year) . They also monitor GS1 Data Source operations (system uptime, request routing). Marketing/communications post news stories (as seen with dozens of articles in 2024 ) and prepare monthly newsletters.
* Standards Advisors & Sector Teams (Internal): GS1 NL assigns standards specialists by sector. In Healthcare, advisors regularly meet with the Uniforme Dataset steering group and hospital procurement staff to define requirements. They check that Dutch UDI rules (MDR/IVDR, LIR) are correctly interpreted. In Retail, liaisons convene manufacturers and retailers in working groups to refine Dutch extensions to GS1 standards (nutrition, circular economy). These teams hold weekly/biweekly calls, update sector data models, and manage initiatives like GS1 Data Care.
* Project & Training Teams: Staff organize and deliver training webinars (e.g. monthly “Kennismaken met barcodes”, “UDI Fundamentals”) . They develop learning materials and schedule events. Projects like “Data Care PoC” ran from April–Oct 2023 with allocated team effort. On a typical week, project teams collect feedback on data gaps (e.g. missing GDSN fields), coordinate with IT for portal features, and liaise with external groups (LIR/CIBG).
* Implementation Partners Coordination: GS1 NL maintains a partner ecosystem. A dedicated “Partner Manager” approves and supports certified partners (software vendors, consultants). Day-to-day they answer partners’ queries about member issues. Weekly tasks include updating the partner directory and organizing joint webinars with partner companies.
* Strategic & Regulatory Monitoring: Management and analysts track changes in Dutch/EU law (e.g. new MDR guidelines or recycling mandates). They ensure GS1 NL’s offerings adapt (e.g. adding new fields to the Uniforme Dataset or data entry portals). Analysts also review member feedback and industry trends, feeding back into product roadmaps. Monthly reports track progress on KPIs (e.g. #members, #GS1 Data Source records).

# **Challenges & Opportunity Analysis (for GS1 Netherlands)**

* Local Regulatory Interpretation: Global GS1 standards must be adapted to Dutch/EU contexts. For example, the EU’s MDR requires Unique Device Identification, but the LIR mandates how UDIs are reported in the Netherlands . GS1 NL must interpret these rules (e.g. which device classes, data fields) and advise members. A challenge is timely communication: members report confusion over new requirements, indicating a need for clearer guidance channels. The ISA can help by providing up-to-date Q&A on local rules (citing government and GS1 NL sources).
* Supporting SMEs and Sector Needs: Many Dutch SMEs have limited IT resources. They need clear, low-effort ways to comply with GS1 rules. For instance, half of med-device suppliers are not in GDSN . SMEs often use Excel to share product data (a slow, error-prone process ). GS1 NL’s opportunity is to onboard more companies into GS1 Data Source and train them on standards. The ISA could serve as a “virtual consultant,” walking an SME through filling a GS1 Data Source template or calculating a barcode check-digit interactively.
* Data Quality & Completeness: A longstanding pain is incomplete product data. GS1 Data Care highlights that fields like “sterile device instructions” or digital documents are often missing . In retail, outdated or inconsistent product catalogs plague supply chains. High-quality AI-driven validation could flag missing or invalid fields against the Uniforme Dataset or Dutch nutritional law. The ISA could proactively prompt users for required data, reducing errors.
* Dissemination of Global Updates: GS1 International regularly ratifies standards changes (new AIs, GS1 Digital Link expansions, DataMatrix rules). GS1 NL must filter and explain what’s relevant locally. Members can be unaware of these changes. The ISA can continuously absorb GS1 global announcements and Dutch sector bulletins, summarizing them in Dutch and advising whether action is needed (e.g. a new GS1 Digital Link use case for EU Digital Product Passports ).
* Technology Adoption: GS1 NL encourages new tech (QR codes, Digital Product Passport). Yet some members resist change. There’s an opportunity for the ISA to showcase use cases: for example, highlighting how Dutch brands use QR codes for Mijn Melk traceability or sustainable packaging stories . By explaining benefits and even generating QR codes with Digital Link on-the-fly, the ISA can lower barriers.

# **Recommended ISA Capabilities (Tailored to GS1 Netherlands)**

* Dutch-Language Knowledge Retrieval: The assistant must operate fluently in Dutch. It should retrieve answers primarily from GS1 NL’s Dutch Knowledge Base and official documents. For example, a user question like “Welke data moet ik invoeren voor UDI Basic in Nederland?” should elicit guidance from GS1 NL’s MDR/IVDR pages , with GS1’s Dutch explanations. (Global GS1 info may be cited for completeness, but localized answers are key.)
* Regulatory & Sector Rule Checking: The ISA should embed GS1’s business logic and local rules. For instance, it should know the “Uniforme Dataset” fields required for medical devices and flag missing elements. It could validate a sample dataset (or an uploaded CSV) and report errors (“veld ‘Certificaatnummer’ ontbreekt, zie Uniforme Dataset”). Similarly, it should check retail data (e.g. mandatory EAN formats, data fields for Nutri-Score). This implies integrating a symbolic rule engine or schema-checker under the hood.
* Natural Language Explanations & Guidance: Answers should be in clear Dutch, using GS1 terminology. The assistant should not just give raw standards text, but explain it conversationally (e.g. “Omdat medische hulpmiddelen in Nederland sinds 2019 via het Landelijk Implantatenregister moeten worden geregistreerd, moet uw artikel een GS1 UDI-code hebben en de gegevens in GS1 Data Source staan” ). It should cite its sources (e.g. footnotes to GS1 NL pages) for traceability.
* Member Inquiry Handling & Contextual Assistance: The ISA should be integrated with MyGS1/CRM so it can identify the member’s profile (base vs premium, registered sectors). It could pull a member’s data (e.g. registered GLNs) to personalize answers. For example, if a member asks “Heb ik nog GS1 Data Source toegang?”, the assistant can check their subscription status. This requires secure API connections to GS1 NL’s member database.
* Automated Validation Support: The assistant should offer data validation tools. E.g. a “Check My Barcode” function where a user enters a GTIN or DataMatrix, and the ISA verifies the check digit and format. Or “GDPR” data check: if user pastes an export from their system, the assistant highlights missing EAN/GLN references. For medical context, it could verify whether a UDI matches a known device in GDSN.
* Interactive Tutorials & Examples: Beyond Q&A, the ISA could walk users through tasks step-by-step. For instance, guiding a user to create a QR Code powered by GS1 with embedded Digital Link (like those shown on GS1.nl) or completing a GS1 Data Source template. It could generate example data entries or connect to a sandbox system.
* Continuous Learning: The assistant should learn from new GS1 NL publications. As GS1 NL posts updates (e.g. the May 2025 news on QR code in ponds ), the system should automatically ingest that content and use it to answer relevant queries.

# **Suggested Architecture Patterns (Considering GS1 Netherlands’ Scale & Needs)**

Given GS1 NL’s ~100-person team and need for explainable answers, a hybrid LLM + knowledge-base architecture is ideal. Core components include: (1) a vector store/RAG built on GS1 NL documents (KB articles, news, FAQs) and cited GS1 global references, enabling retrieval-augmented responses; (2) a knowledge graph or schema encoding GS1 taxonomies (product attributes, UDI fields, sector models) so the assistant can reason with structure; (3) an LLM API (fine-tuned or prompt-engineered for Dutch/GS1 content) to generate natural answers. This hybrid approach “addresses [complex] challenges” by linking unstructured queries to structured GS1 data and rules .

For example, the graph component could link a GTIN to its product attributes and validate them against the Uniforme Dataset schema (leveraging NVIDIA’s GraphRAG concept ). The RAG component pulls in relevant GS1 NL texts (e.g. quoting the Exact requirement from the GS1 NL KB when answering regulatory questions), ensuring traceability. All LLM-generated text would be accompanied by citations to the GS1 NL site.

Practically, this suggests a microservice architecture:

* A Retrieval service indexing GS1 NL content (possibly using Elasticsearch or a vector DB) and delivering context passages to the LLM.
* A Knowledge base service with the Uniforme Dataset schema, MDR field list, etc., for rule checks (could use a SPARQL or JSON-based rules engine).
* A LLM inference service (e.g. on cloud or on-premise) orchestrating prompts in Dutch, including context from retrieval and logic checks.
* Integrations to existing systems: an API connector to GS1 Data Source (to fetch or validate GDSN entries), and to the MyGS1 CRM (for member context and logging interactions).

Traceability is ensured by logging all query-context pairs and citations. Explainability is bolstered by the knowledge graph: when the assistant makes a determination (e.g. “field X is missing”), the graph can show the logical path (source schema → missing node). This matches best practices of hybrid “LLM-driven knowledge graphs” which enhance reasoning .

The architecture should be scalable (use container orchestration for the LLM and databases) and secure (internal GS1 NL network for sensitive member data). It should permit human override: e.g. if unsure, the ISA defers to a GS1 NL advisor or generates a support ticket.

# **References**

* GS1 Nederland official site (functional descriptions and news) .
* Sector pages: Levensmiddelen & drogisterij and Gezondheidszorg sections .
* GS1 NL Kennisbank and Tarieven pages (membership, Data Source, Data Care) .
* GS1 NL Healthcare documentation (Uniforme Dataset, Landelijk Implantaten Register) .
* GS1 NL news articles (Nutri-Score, QR code cases) .
* GS1 NL Data Care program description .
* Organizational data (GS1 NL staff size) .
* Knowledge assistant design (LLM+KG hybrid) .

Note: References marked with GS1 NL content (often Dutch) are from the official GS1 Netherlands website. Any GS1 AISBL/global references used are noted, but this report centers on GS1 Netherlands sources.