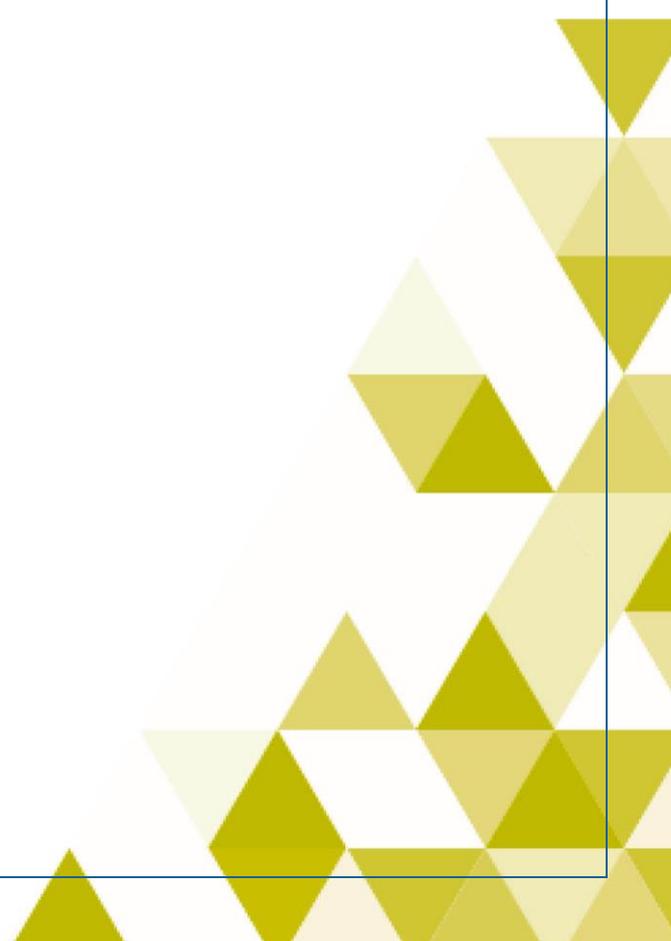




Sense for Innovation
IOT BUSINESS CONCEPTS

Internet of Things Business Concepts
White Paper
‘Workflow Project Development’



Introduction

The Internet of Things (IOT) is the interconnection of uniquely identifiable embedded computing devices within the existing Internet infrastructure.

- IOT impacts every business. Mobile and the Internet of Things will change the types of devices that connect into a company's systems.
- These newly connected devices will produce new types of data.
- The Internet of Things will help a business gain efficiencies, harness intelligence from a wide range of equipment, improve operations and increase customer satisfaction.
- IOT will also have a profound impact on people's lives. It will improve public safety, transportation and healthcare with better information and faster communications of this information. There are many ways that the Internet of Things could impact society and business.
- Growth of the Internet in the past two decades is about to be overshadowed as the "things" that surround us start going online.
- The "Internet of Things" (IOT), a term has become a new paradigm that views all objects around us connected to the network, providing anyone with "anytime, anywhere" access to information
- The IOT describes the interconnection of objects or "things" for various purposes including identification, communication, sensing, and data collection
- The IOT represents the future of computing and communications, and its development depends on dynamic technical innovation in fields such as RFID, sensor technologies, smart things, nanotechnology, and miniaturization.

Summary

In this white paper we address all the necessary steps to successfully develop an IoT Business Concept. Our workflow is the result of internal and external projects that we have run the last 5 years, in co-operation with our development team in India. The workflow consists of 7 steps:

1. Feasibility check
2. Business proposal
3. Cloud and Mobile development
4. Product Prototyping
5. Industrial Design
6. Certification
7. Manufacturing

Introductie

Het Internet of Things (IoT) is de verbinding tussen identificeerbare 'embedded computing devices' binnen een (bestaande) internetinfrastructuur. Het gaat om alledaagse voorwerpen die als semi-intelligente apparaten via internet met elkaar en met mensen communiceren en zelf beslissingen kunnen nemen en acties uitvoeren. Ze hebben allemaal een eigen, unieke identiteit.

Op termijn zal het internetgebruik van deze voorwerpen groter zijn dan het internetgebruik van de mens via desktops, laptops, tablets en smartphones. Wat betekent dit voor bedrijven en organisaties?

- IoT heeft impact op elke business. Het Internet of Things helpt bedrijven en organisaties om efficiënter te opereren, intelligentie (data, kennis) te verzamelen van een brede range aan apparaten, operationele zaken te verbeteren en de klanttevredenheid te verhogen.
- Mobiel en de Internet of Things veranderen de typen devices die verbinden met onze bedrijfssystemen. Deze nieuwe, (onderling) verbonden devices produceren nieuwe typen data.
- Het Internet of Things zal ook een groot impact hebben op het leven van mensen. De kwaliteit van openbare veiligheid, transport en gezondheidszorg neemt toe door betere informatie en snellere communicatie van deze informatie.
- De groei van het internet in de afgelopen 20 jaar zal overschaduwd worden als de 'dingen' die ons omgeven zelf online gaan.
- De term 'Internet of Things' is een nieuw paradigma voor alle objecten rondom ons, verbonden aan het netwerk, die ons 'altijd en overal' van informatie voorzien.
- Het Internet of Things beschrijft de verbinding tussen objecten of 'dingen' voor uiteenlopende doelstellingen, waaronder identificatie, communicatie, aftasten (omgeving) en dataverzameling.
- Het Internet of Things verbeeldt de toekomst van automatisering en communicatie. De ontwikkeling ervan hangt samen met de technische innovatie op het gebied van RFID, sensortechnologie, smart things, nanotechnologie en miniaturisatie.

Samenvatting

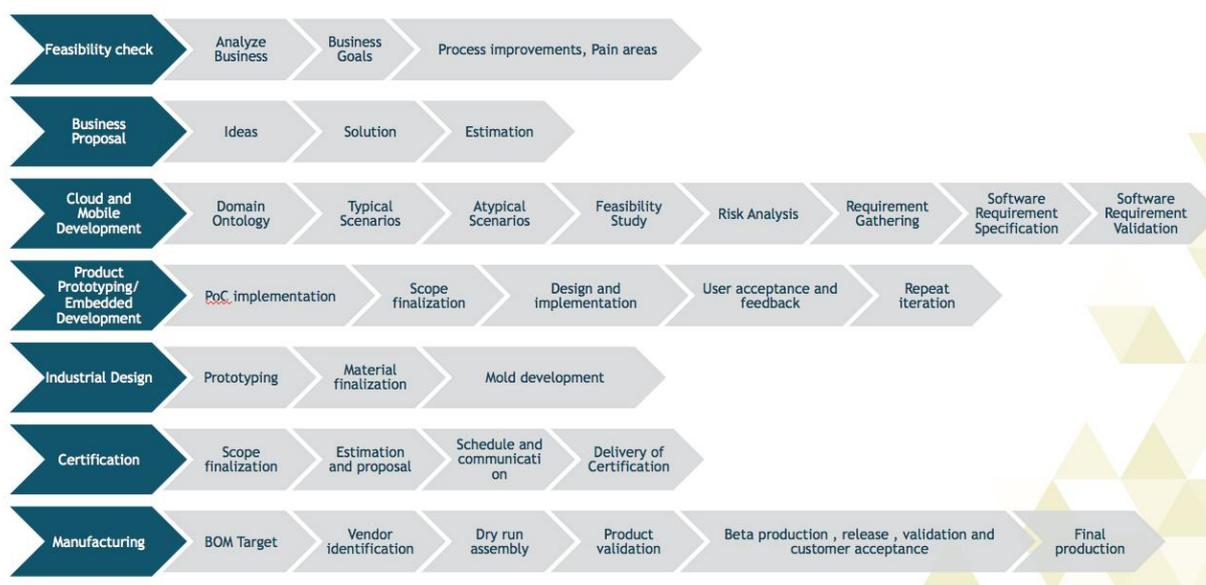
In deze white paper beschrijven we alle stappen die nodig zijn om een IoT Business Concept succesvol naar de markt te brengen. Onze methodiek - workflow - is het resultaat van interne en externe projecten die wij de afgelopen 5 jaar hebben uitgevoerd, in samenwerking met ons ontwikkelteam in India. De methodiek bestaat uit 7 stappen:

1. Haalbaarheidsonderzoek
2. Business voorstel
3. Cloud en Mobiel ontwikkeling
4. Product prototyping
5. Industrieel ontwerp
6. Certificering
7. Productie, fabricage

Workflow development IoT Business Concepts

In 7 steps we address all the necessary steps to successfully develop an IoT Business Concept. This workflow is the result of internal and external projects that we have run the last 5 years, in co-operation with development team in India.

Workflow



Feasibility check



The feasibility process is completed prior to project initiation, it can be utilized to see if a set of processes or procedures will enhance or harm project outcomes.

Analyze Business

- Project Description - Identify the project name and purpose. Include details including stakeholders, and end result expected.
- Goals - List long and short-term goals and what processes will be needed to achieve those goals.
- Timeline - What will be the estimated time until project completion?
- Costs and Budgeting - Include all costs incurred for the project including the cost of the feasibility study itself.
- Purpose - What purpose does the project have and whom will it benefit?
- Market Analysis - If applicable, will the market or market environment benefit from the project. If so, list why.
- Resources - Identify all the resources both IT, technical, inventory, and human that will be needed to complete the project.

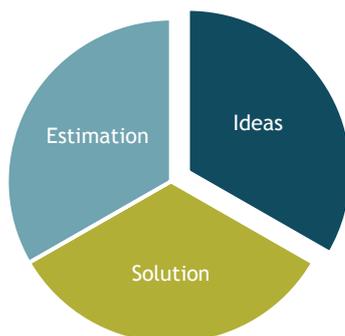
- Project Process - How will the project flow? Include flow charts showing project stages.
- Management and Teams - Who will manage and who will work on scheduled tasks?
- Observations- Statements that do or don't support the project should be included here. If for a client, does the client have the finances to complete the project or are there alternatives? If for a project or process, will it work and will it be beneficial?
- Process improvements and Pain areas - Will analyze existing business process and identify improvement along with pain areas.

Document Study Report

After the completion of a study, a determination may be made not to proceed with the project. A feasibility study will include:

- Project Problems - Does the study include risk or problematic areas that need to be addressed and are they clearly identified?
- The Outcome - Every study should identify the process, product, client request, and goal and how they will affect the outcome; positively or negatively. Will outcomes be beneficial or deterrent?
- Assessment - The assessment part of proposal include risk management and controls, solutions, if the project is feasible

Business Proposal



- Brainstorm solution to identify challenges during feasibility check and come up with multiple ideas to address it.
- Alternatives - Are possible alternatives available or suggested and researched?
- How the project should be implemented?
- Based on possible multiple options we will also propose estimation for easy decision.

Cloud and Mobile Development



Sense for Innovation will deliver a complete cloud solution platform based on customer requirement. Our managed software development, independent software testing and professional services span commercial software products, SaaS solutions and custom applications across enterprise, cloud, mobile and web development.

- **Domain Ontology:** Business analyst will describe naming and definition of the types, properties, and interrelationships of the entities that fundamentally exist for a particular domain. This will simplify understanding of particular domain.
- **Requirements Scope:** The scope and boundary of the proposed software solution is drawn based on business requirements and goals.
- **Stakeholder Identification:** Identifying stakeholders such as customers, end-users, system administrators etc. is the next step in requirements analysis. This is one of the most important steps in the whole process as proper identification of stakeholders enables the business analyst to draw a road map for gathering requirements.
- **Requirements Elicitation / Requirements Gathering:** Post identification of stakeholders, the tedious process of eliciting requirements follows. Based on the scope and nature of a particular software solution there can be multiple stakeholders. Interaction happens with stakeholder groups using various communication methodologies including in-person interviews, focus groups, market study, surveys and secondary research.
- **Typical Scenarios:** Business analyst will figure out typical scenarios that must be considered while developing the product.
- **Atypical Scenarios:** There may be some atypical scenarios that must be figured out before starting the development of the product. We will try to find these scenarios which may be related to the specific domain.
- **Feasibility Study:** Our business analyst will do the feasibility study to make the product viable. Feasibility can be judged from two most important criteria i.e. cost and value. Feasibility studies, aim to objectively and rationally uncover the strengths and weaknesses of the proposed product, opportunities and threats present in the environment, the resources required to carry through, and ultimately the prospects for success
- **Risk analysis** is a process that involves "gathering data and synthesizing information to develop an understanding of the risk involved in development of the proposed product".
- **Requirement Analysis:** Once user data is gathered, structured analysis is carried out on this data to determine models. Usually use-cases are developed to analyze the data on various parameters depending on the larger goals of the software solution. We use requirements animation, automated reasoning, knowledge-based critiquing, consistency checking, analogical and case-based reasoning.
- **Software Requirement Specification (SRS):** Once the captured data is analyzed these are put together in the form of a software requirement specification document (SRS) or a system requirement specification (SYRS) document. This document serves as a blueprint for the design or development teams to start building the solution on. It serves as a technical compendium of all the stakeholders' needs including user requirements, system requirements, user interface and operational requirements.
- **Software Requirements Management and Validation:** The final step of the requirements analysis process involves validating all elements of the requirements specifications document. Errors are corrected here and it can also accommodate minor changes to requirements of the proposed software solution.

Embedded hardware and software Development



Sense for Innovation offers its expertise in designing embedded hardware boards and computing modules. We have experience in designing ARM processors based platforms including those with various Cortex and ARMv4 cores. Design and Development of Custom Modules/Boards/SBC's using,

- Micro controllers & processors : 8/16/32 bit MCUs, ARM 7, ARM9, ARM11, DSP based designs from Atmel, Freescale, Microchip, NXP, TI, Renesas IMX233, LPC2148, 89C51, RL78G10, 80TINY, PIC16, PIC18, AM3352
- Wireless interfaces :RF Transceivers - sub 1 GHz, 2.4 GHz, GSM-GPRS Modem, ZIGBEE, Wi-Fi, Bluetooth, NFC
- Peripheral interfaces :LCD's - Alpha numeric, TFT, Graphics, MIPI, Touch buttons, Touch Screens, Thermal Printers, Key board, Biometric sensors, VFD, LED Displays, Motion, Temp. Sensors, Light sensors, Finger print sensors
- Protocols interfaces :SPI, I2C, RS232, RS422, RS485, Ethernet, USB, TCP/IP, CAN, IrDA, and proprietary protocols
- PCB Layout design Services using PADS, Cadence Allegro, ORCAD

Product Prototyping



- **PoC implementation:** As per the requirement analysis we will come up with embedded hardware with Proof of Concept boards for prototyping. This PoC outcome will be shared with Customers and based on finding we improve it with lab iteration.
- **Scope finalization:** Scope for hardware will be finalized during requirement analysis which will be validated with PoC findings.
- **Design and implementation:** Embedded hardware PCB (Printed Circuit Board), Microcontroller and component will be identified and proceed with PCB design and component assembly.
- **User acceptance and feedback:** Developed prototype with RPT casing will be delivered to customer for acceptance and feedback.
- **Repeat iteration:** Based on feedback if changes need then will proceed with design iteration for hardware.

Industrial design



Industrial Design is the most important step in the development of most successful products and yet it is often the most difficult to explain in terms of tangible benefit. Industrial Design concerns itself with how human factors (desirability), technical factors (feasibility), and business factors (viability) interact to define a product.

Industrial Design is the professional service of creating and developing concepts and specifications that optimize the function, value, and appearance of products and processes.

- **Prototyping:** Deliver design ideas that is feasible, practical and attractive and in-line with original product design concept. Rapid prototyping is used to check fitments, usability and look n feel of product.
- **Material finalization:** It is important to choose material for BOM (bill of materials) and as well as CE Marking Certificate. The mechanical design group studies the way a product will be used and the ideal design for manufacturing. Through a series of virtual prototypes and simulations, designers can accurately predict problems and discover enhancements at an early stage, when changes are still fast and inexpensive. With the help of technology partner, we deliver comprehensive mechanical design solutions in all stages of development-complementing our client's core competencies with our own.
- **Mold development:** After finalization of RPT (Rapid Prototyping), we can proceed with silicon mold for sample prototyping or final mold based on design acceptance and required quantity.

Certification (CE Marking)



The EU introduced the CE marking scheme to make trade easier and cheaper between EU countries. It means that a manufacturer claims that their product conforms to the minimum legal requirements for health and safety as laid down in EU directives.

CE Marking is independent of the quality requirements of the product as it applies with mandatory European safety requirements.

This mark indicates that the manufacturer has ensured each of their products bearing this mark have undergone testing and conform to the standards set forth in the European Directive(s) applicable to each product respectively. It means a mark is being placed on products by their manufacturer acting as a statement that the product meets all the standards and requirements of the relevant legislation according to the appropriate European Directives.

We help the manufacturers in accessing into the European market to sell their products without adaptation or re checking. Beside this, we also help our clients in understanding the CE regulations and provide help regarding CE marking services.

CE marking services are quality certification services used to indicate conformity with the essential health and safety requirements set out in European Directives.

- **Scope finalization:**
 - PCB design consultancy
 - Support for
 - Identification of applicable Directives
 - Identification of applicable Standards
 - Identification of applicable Tests
 - Identification of safety critical components
 - Technical File (TF) compilation
 - Technical Audit of Product
 - TF (Technical File) review
 - Issue Statement of Confirmation

- **Estimation and proposal:** Estimation of certification activity can be done after first prototype of the product with working PCB is ready. Proposal is based on scope of certification activity which can be end to end or partial (Ex. design consultancy only).
- **Schedule and communication:** Depending upon product preparedness, usually it takes around 12 weeks for CE certification process considering full scope.
- **Delivery of Certification:** After tests are carried out in the lab and product is found to be confirming to required certification standards, required documentation is done and statement of confirmation is given to OEM. In case of self-certification, statement of confirmation and required supporting documents should be available. If another agency gives certificate, product must follow customized process according to certification requirements.

Manufacturing



We will help you with following manufacturing activities.

- **BOM Target:** A bill of materials (BoM) is a list of the parts or components that are required to build a product. The BoM provides the manufacturer's part number (MPN) and the quantity needed for each component. BOM is the starting point for arriving at the final cost of the product. BOM target will help to validate the business case.
- **Vendor identification:** Vendor identification needs to be done who will mass manufacture the product. The choice depends upon many factors like the material to be used, convenient geographic location, quotation etc.
- **Dry run assembly:** A dry run is a testing process where the effects of a possible failure are mitigated. Before going to mass production, this process is must.
- **Product validation:** Product validation will be done to check if product meets the requirements and specifications and it fulfils the intended purpose.
- **Beta production, release, validation and customer acceptance:** This is also called as User acceptance testing. In this test, it is determined if the solution works for target user. Limited number of product are produced in this phase and given to customer for his acceptance. This steps is essential before going to final production
- **Final production:** Once user accepts the product, it is good time to go to market with final production. Based on target, number of quantities to be produced is determined. As per the market response or demand, scale of production can be gradually increased.

More information

U kunt contact opnemen met Harry Viet voor meer information.

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