FACULDADE DE CIÊNCIAS E TECNOLOGIA

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING

DIOGO FERREIRA DE OLIVEIRA GONÇALVES DA FONSECA

BSc in Sciences of Industrial Engineering and Management

DEVELOPING A FRAMEWORK TO EVALUATE THE APPLICABILITY OF A DIGITAL RETAIL SOLUTION TO VARIOUS BUSINESS SCENARIOS.

INTEGRATED MASTER IN INDUSTRIAL ENGINEERING AND MANAGEMENT

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Developing a framework to evaluate the applicability of a digital retail solution to various business scenarios.

To my family and to the ones who believe in me.

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"Give your heart and change your mind, you're allowed to do it. 'Cause God knows it's been done to you and somehow you got through it. Alive in The Age of Worry, Smile in the Age of the Worry, (…), Act your age in the Age of Worry and say: "Worry get out of here""
(*The Age of Worry* - John Mayer).

Abstract

In the midst of relentless technological innovation, employee-driven digital solutions are reshaping retail and raising expectations for execution, communication and traceability. This empirical study draws on the literature on information systems and innovation, employee-driven innovation and structured approaches to value, needs and fit to show how such tools can be assessed credibly across contexts. The aim is to provide a clear, testable framework to judge how far a digital retail solution can travel across sectors.

Conducted in collaboration, a Portuguese food retail and distribution group, the dissertation examines a digital retail solution, a tablet-based, paperless system that replaces fragmented paper routines with a single workspace and strengthens traceability, planning, communication and oversight. The study assesses cross-sector applicability by translating interview evidence into structured requirements and evaluating coverage across operational, support and management layers. Three contrasting business cases are used to exercise the framework, with results consolidated in a decision-ready dashboard that links requirements to system choices.

Findings indicate a stable core that remains relevant across settings, alongside sector-specific gaps that guide configuration, roll-out sequencing and focused development. The framework separates immediate anchors from near-term opportunities and unmet needs, enabling comparable decisions across cases and offering a defensible basis for adoption planning and product evolution. The contribution is a replicable method that connects elicited requirements to system capabilities and presents priorities in a concise dashboard for decision makers. The work also acknowledges limits related to access, participant profiles and scope, motivating broader validation and deeper expert input in future applications.

Keywords: Employee-Driven innovation, Digital Retail Solution Framework, Model

RESUMO

Em plena transformação tecnológica, as soluções digitais orientadas pelos colaboradores estão a remodelar o retalho e a elevar as expectativas quanto à execução, comunicação e rastreabilidade. Este estudo empírico apoia-se na literatura de sistemas de informação e inovação, na inovação impulsionada pelos colaboradores e em abordagens estruturadas a valor, necessidades e adequação, para mostrar como estas ferramentas podem ser avaliadas de forma credível em diferentes contextos. O objetivo é oferecer uma Framework clara e testável para julgar até onde uma solução digital de retalho pode viajar entre sectores.

Realizada em colaboração com um grupo português de retalho e distribuição alimentar, a dissertação examina uma solução digital de retalho, um sistema sem papel baseado em tablet que substitui rotinas fragmentadas por um único espaço de trabalho. A aplicabilidade intersectorial é avaliada traduzindo evidências de entrevistas em requisitos estruturados e medindo a sua cobertura nas camadas operacional, de suporte e de gestão. Três casos de negócio contrastantes exercitam o modelo, e os resultados são consolidados num painel pronto para decisão que liga requisitos a escolhas de configuração.

As conclusões apontam para um núcleo estável que permanece relevante em diferentes contextos, a par de lacunas específicas de sector que orientam a configuração, a sequência de implementação e o desenvolvimento focalizado. A Framework separa âncoras imediatas de oportunidades de curto prazo e necessidades por satisfazer, permitindo decisões comparáveis entre casos e oferecendo uma base defensável para o planeamento de adoção e a evolução do produto. A contribuição é um método replicável que liga requisitos recolhidos às capacidades do sistema e apresenta prioridades num painel conciso para decisores, reconhecendo limites de acesso, perfis dos participantes e âmbito, e motivando validação alargada e maior contributo de peritos.

Palavras-chave: Inovação impulsionada pelos colaboradores, solução digital de retalho, Framework, Retalho

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ACRONYMS

AI	Artificial Intelligence
DIANA	Define, Increase, Assess, Narrow, Act
DRS	Digital Retail Solution
DSS	Decision Support System(s)
EDI	Employee Driven Innovation
EIS	Executive Information System(s)
ERP	Enterprise Resource Planning
EU	European Union
HOQ	House of Quality
IS	Information Systems
KDM	Key Decision Maker(s)
AHOQ	Applicability Houses of Quality
ASYS	Applicability System
MIS	Management Information System(s)
OSS	Office Support System(s)
QFD	Quality Function Deployment
RQ	Research Questions
TPS	Transaction Processing System(s)
VCW	Value Creation Wheel

1

INTRODUCTION

1.1 Context and Motivation

In today's environment, innovation is critical to sustain relevance and market competitiveness. Retail reflects this shift, moving from isolated upgrades to integrated change that reshapes daily work. Current practice emphasises capturing operational data at source and making guidance available at the point of action. Ease of use and dependable routines are essential under time pressure, while regulatory demands such as food safety and traceability reinforce the move from paper to reliable digital records. Retail innovation centres on tools that simplify execution at the point of work, reduce fragmentation and strengthen traceability.

On the employee side, a distinct approach has emerged, known as Employee Driven Innovation (EDI), that channels innovation towards frontline benefit, elevates frontline insight and treats staff as active partners in shaping digital routines that reflect real work constraints and strengthen safe, efficient and accountable practice.

At shop floor level, the Digital Retail Solution (DRS) arrives as a tablet based, paperless application that gathers the moving parts of a shift into one place. Developed by a Portuguese food retail and distribution group, it is a digital retail solution that replaces scattered paper notes with clear, auditable records and keeps guidance, tasks and communication within easy reach. In short, it is built to make employees' everyday work simpler, safer and more coordinated.

The brief from the company arrived as a practical challenge, inviting a considering examination about where the DRS might belong next. The question stands as whether the DRS could travel beyond its original retail setting and, if so, how to choose the next business scenarios for application and possible sale with clear evidence rather than opinion. The response begins by pausing to understand the tool itself, therefore, it is characterised in depth so that its value proposition, functional scope and alignment with operational, support and management levels are understood through the lens of retail, EDI and Information Systems. With that foundation in place, the work moves from description to decision. A framework is developed to render fit as an explicit judgement through a model that scores the alignment between sector requirements and DRS's capabilities, drawing on the Value Creation Wheel (VCW) and the

House of Quality. Applicability can then be computed, compared and defended, giving ˇthe company a clearer basis to decide where to apply DRS first.

To close, the work tests the framework in three contrasting case studies beyond DRS's original domain, translating interview evidence into requirements through a structured elicitation process and assessing these against the DRS's functionality to produce an applicability score and concise decision outputs. At the same time, the study addresses an academic gap, since transparent and repeatable assessments of cross sector applicability in information systems remain limited, with few studies linking elicited operational needs to specific platform capabilities and expressing coverage with clear, auditable criteria.

1.2 Thesis Objectives

To provide a roadmap for the dissertation a clear set of objectives is outlined. The aims below explain why each topic is addressed in the literature review and how the study responds to the company's challenge.

- Review innovation in modern organisations with emphasis on retail innovation and the paperless shift.
- Establish foundations in information systems and their levels.
- Examine employee driven innovation as the lens that aligns digital tools with frontline needs.
- Define the concept of value proposition and articulate the DRS's value proposition.
- Characterise the DRS as a digital retail application developed by the company, detailing scope, features and intended outcomes.
- Determine how to elicit and structure client information system needs in a transparent and repeatable way.
- Develop a model to compute the DRS's adaptability to different business scenarios.
- Apply the model to contrasting case studies to test transferability.

These objectives set the scope of the study, guide the literature review and methods, and lead directly to the research questions that structure the empirical work by refining the inquiry into specific, testable prompts.

1.3 Research Questions

Deriving from the thesis objectives and to clearly ensure a coherent direction while preserving focus throughout the dissertation, it is necessary to establish the research questions that are going to guide both the theoretical and practical dimensions of this dissertation.

The first part of the inquiry frames the theoretical foundation by defining the DRS's value proposition and by characterising its functionalities with precision. Establishing these pillars provides a shared vocabulary for a thorough analysis and sets the stage for an

assessment that is both comparable across settings and actionable for decision makers. The research questions are presented below, each followed by a brief note outlining the intended output:

RQ1.1: What is the DRS's value proposition?

This research question aims to articulate a clear statement of purpose that specifies the problem addressed, the benefits delivered for frontline work and management, and the outcomes that justify THE DRS's relevance within retail operations.

RQ1.2: How can the functionalities of the DRS application be characterised?

This research question's objective is to produce a structured description of the DRS's capabilities, related to information system levels across operational, support and management decision layers, establishing shared definitions and a consistent nomenclature for later analysis.

The second part turns to practice as it focuses on a rigorous procedure to identify the information system needs of the customer and on the design of a scoring methodology that assesses THE DRS's applicability in different business scenarios:

RQ2: How can the information system needs of a business case be defined in order to evaluate the DRS's applicability?

This question seeks to establish a transparent, repeatable procedure for eliciting sector requirements in clear language and organising them into operational, support and management categories to inform the applicability assessment.

RQ3: How can a methodology be developed to score the applicability of the DRS to a business case?

This question develops a computable scoring approach that quantifies the match between elicited requirements and the DRS's capabilities, yielding an applicability score and concise decision outputs suitable for comparison across scenarios.

Taken together, these questions provide a comprehensive framework for the thesis. The first two establish conceptual clarity about what the digital solution offers and how it operates while the last two translate that clarity into a practical process for eliciting customer requirements and a defensible method for assessing applicability across contexts.

1.4 Limitations of the Thesis

Ahead of any analysis, there is a need to set out the constraints that shaped the scope of this dissertation. Regarding the DRS, access to information about the application was limited since only partial internal documentation was available and shared, which meant the empirical component relied on what could be observed and drew from participants. Furthermore, the scoping phase required thorough consultation with academic and company advisors to define a research question that balanced rigour with feasibility in an operational setting, this consequently, compressed the timetable for data collection and reduced opportunities for recruitment and iteration. Primary data were gathered by a single researcher, yielding a dataset that is rich in context yet bounded in coverage, so caution is advised when extending insights to settings that differ materially from those observed.

However, projects of this nature are rarely conducted under perfect conditions across all domains of inquiry, and the evidence assembled, together with the methods employed, remains sufficient to generate credible insights and to inform strategic decision making.

1.5 Methodology

The methodology traces a line from theoretical grounding to operational judgement making it the detailed spine of this dissertation. The first movement establishes an intellectual base where innovation in modern organisations is reviewed with attention to retail practice and to the paperless turn that replaces dispersed notes with reliable records. Future oriented debates around artificial intelligence and immersive environments are treated as contextual signals rather than scope. Information systems are then framed through a five-level pyramid model to clarify roles at operational, support and management levels. This structure anchors the language used throughout the dissertation and anticipates how evidence is organised. A focused review of employee driven innovation follows with detail to typologies, drivers and barriers.

With the foundations in place, the work turns to method. The Value Creation Wheel is adopted to guide disciplined elicitation and synthesis. Within it, the DIANA stages support the design of a concise instrument by defining the challenge, increasing and assessing candidate prompts, narrowing the set to those that are clear and sector neutral, and acting on the results. The VCW Funnel is used to keep wording simple and to maintain focus on needs rather than solutions. In parallel, Quality Function Deployment is analysed to recover the logic of the House of Quality, since a transparent connection between customer requirements and system capabilities is needed for later evaluation.

The empirical core begins with a full characterisation of the DRS and of the organisational setting in which it was created by the company. The DRS's value proposition is articulated, and its features are described in detail. Each feature is positioned within the information systems pyramid and then regrouped into operational, support and management categories

to bridge the system with the levels used later in analysis. This stage answers the first part of the inquiry by establishing a shared vocabulary and a precise map of functionality.

Attention then shifts to defining information system needs in a form that can inform an applicability judgement. A questionnaire is constructed using the Value Creation Wheel and the DIANA framework due to its flexibility and to ensure clarity. A short interview script supports one to one administration so that responses can be translated into discrete requirements aligned to the three information levels. This procedure provides a repeatable route from interview evidence to structured inputs.

A model is developed next to compute the DRS's adaptability to different business scenarios. The Applicability Houses of Quality build on the House of Quality to express the match between elicited requirements and system capabilities across three houses that mirror the information levels. Calculations are kept simple and auditable to support discussion whereas outputs include an applicability score for each case, a ranked view of features and a concise dashboard for decision makers. To connect all stages from sector scoping to scoring, the Applicability System sets out the sequence of actions that turns method into practice.

The framework is exercised through three case studies in TV production, nursing and construction retail. Each case follows the same path from interview to requirements to matrices and scoring, which enables comparison and reveals gaps that would matter at implementation. A cross-case synthesis then draws patterns that inform transferability and feature prioritisation, linking evidence back to the research questions.

The chapter closes by noting that the methodology provides a continuous thread from literature to method to decision. The sequence clarifies what the DRS offers, demonstrates how customer needs can be elicited in a transparent way and shows how fit can be computed rather than asserted. The results that follow present applicability scores and decision outputs for the three cases, and the concluding chapter reflects on implications, limitations and future directions.

1.6 Thesis Structure

Starting with **Chapter 1 - Introduction**, it sets the scene by presenting the context and motivation, stating the thesis objectives and the research questions that derive from them, outlining the methodological stance and acknowledging the study's limitations. It concludes with an overview of the structure that follows.

The discussion now turns to **Chapter 2 - Theoretical Foundations of Information Systems and Innovation**, which establishes the conceptual base on innovation and its expressions in organisations and retail. It considers future and green trends and treats innovation as a performance lens. It then frames information systems by type and by pyramid level and links information systems to business strategy, closing with notes on commercialisation and technology driven business models illustrated through short cases.

Chapter 3 - Employee Driven Innovation, examines typologies and key drivers such as culture, motivation and alignment, and considers common barriers including workload

pressure and structural rigidity. It concludes with the theoretical frame used later to interpret frontline contributions.

The analysis proceeds to **Chapter 4 - Frameworks for Value, Needs and Applicability Assessment**. This chapter introduces the value proposition lens and the Value Creation Wheel, addresses the challenge of eliciting customer information system needs and motivates the use of structured processes such as DIANA. It then considers system fit through the fundamentals of Quality Function Deployment and the House of Quality, which underpin the applicability model used in the case work.

The focus moves to **Chapter 5 - Characterising the DRS System**, which presents the organisational context, the origins and purpose of the DRS, a consolidated list of its features, the resulting value proposition and a functional classification across operational, support and management layers that bridges the system with the information systems pyramid.

Chapter 6 - Methodology, details the mixed methods strategy and the case study design. It describes the DIANA guided questionnaire, its script and its sectioning by information system layers, introduces the Applicability Houses of Quality model, explains the rating and calculation logic, and sets out ASYS with its stepwise execution and dashboard. The chapter closes with the sector selection criteria for the empirical work.

Chapter 7 – Case Studies, Results and Analysis, reports three case studies in distinct sectors followed by cross case synthesis and interpretation. The presentation aligns needs, feature coverage and applicability indicators to surface patterns that inform deployment choices.

Finally, **Chapter 8 - Conclusion**, summarises the main contributions and answers to the research questions, reflects on implications for practice and revisits limitations and avenues for future work.

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2

THEORETICAL FOUNDATIONS OF INFORMATION SYSTEMS AND INNOVATION

2.1 Innovation in the Modern Organisation

2.1.1 Defining Innovation

Through centuries, innovation has become a rather complex and multifaceted term to define. Besides the fundamental concept of discovering a new and, ideally, more effective method for performing a task, traditionally carried out in a conventional manner, innovation is now also a core action for the development and productivity of any economic activity [1].

Deriving from the Latin word *innovar*, which means "to renew" or "to make new", innovation comes from the addition of the prefix in- ("into") and novus ("new") and enters the English dictionary amid the 15th century, initially carrying a sense of introducing change, often viewed with suspicion. Over time, the meaning shifted to focus more on the creation of new methods, ideas, or products, particularly in relation to technological and scientific progress [2].

According to [3], as with any interdisciplinary term where you want to define it, 'innovation' cannot be conceptualised in a single way, as it would never be able to satisfy the needs of everyone who seeks to understand it.

Therefore, innovation is a complex and evolving concept that resists a single definition. Once viewed with suspicion, it is now vital for progress, especially within organisations, where it drives adaptation, efficiency, and long-term competitiveness.

2.1.2 Innovation in Organisations

As technology becomes deeply embedded in the operational world, innovation has become a crucial strategy for organisations to keep up with market shifts and maintain competitiveness, while resilience is increasingly recognised as key to effectively navigating external challenges [4].

In [5], the authors underline three main typologies for conceptualising organisational innovation. First, the socio-technical systems approach differentiates between technical innovations (relating to products or production methods) and administrative innovations (concerning organisational structures and processes), noting that administrative changes usually come after technical ones but can then spark more technical changes. Second, the innovation characteristics approach examines attributes including radicalness (degree of novelty and risk), temporal nature (programmed versus emergent initiatives), and functional purpose (instrumental versus ultimate innovations), demonstrating how these dimensions shape adoption patterns and implementation outcomes. Finally, the sources of innovation approach categorise innovations by provenance: emergent (internally generated), adopted (externally sourced), or imposed (regulatory or externally mandated), with each classification presenting distinct implementation challenges and organisational responses.

However, innovation in business is crucial to secure long-term success and market relevance. It fuels growth by developing new products, services, and processes that meet customer needs while boosting efficiency. Companies that embrace innovation, whether through technology, business models, or culture, gain an edge over competitors, whereas those that resist risk falling behind as markets evolve [6].

2.1.3 Retail Innovation

While playing a critical role in enhancing a business position in the market, retail innovation also shapes consumer experiences and drives loyalty in an increasingly dynamic marketplace. Traditional retailing has often lagged in technological development whereas now new systems such as self-service technologies, mobile apps, and digital signage are transforming customer interaction and service delivery [7]. Beyond operational improvements, innovation also influences customer perceptions of value, especially in areas like entertainment, which in turn affect satisfaction and loyalty. Understanding the interplay between innovation, perceived image, and consumer behaviour is essential to identifying effective strategies in both utilitarian and experiential retail contexts [8].

As technology keeps helping innovation in retail, some strategies take control of the entire market, such as the omnichannel retail strategy, which integrates multiple shopping channels, such as physical stores, websites, mobile apps, and delivery platforms, into a unified customer experience. In this context, Figure 2.1 illustrates a typology of retail innovations across three stages of the retail encounter: purchase, payment, and delivery. Each stage highlights technologies designed to enhance convenience, reduce labour, or shift operational responsibilities to the customer. For example, purchase innovations include tools like kiosks, QR codes, and apps that help customers find and evaluate products more efficiently. Payment innovations focus on streamlining checkout, featuring self-checkout stations and cashierless stores. Finally, delivery innovations are categorised by mode, location and trade-offs between speed and cost. This framework helps clarify how retailers are reshaping each step of the consumer journey in an omnichannel environment [9].

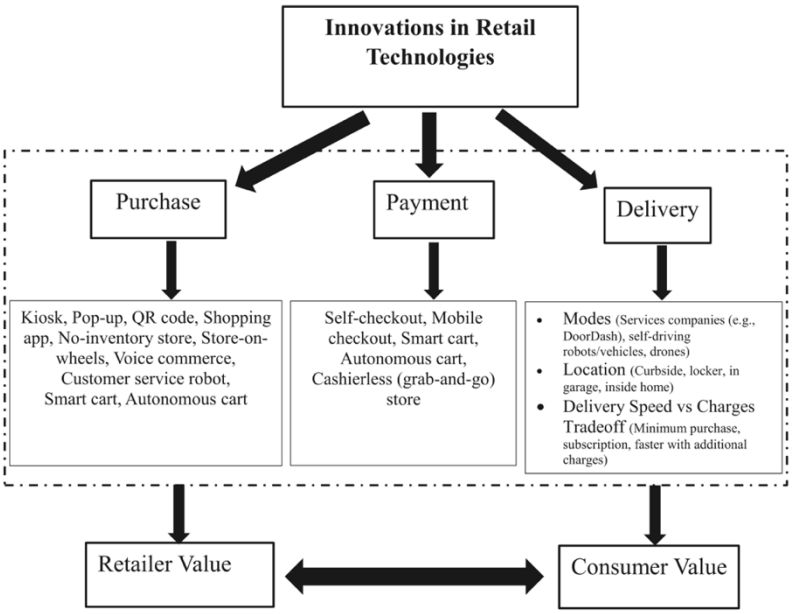

Figure 2.1 — A summary of innovations in retail encounters (Source: [9])

Innovation can manifest in two distinct yet interconnected ways: through product development or process enhancement, or through a synergistic combination of both. The primary aim of innovation lies in achieving distinctiveness, with empirical evidence demonstrating a correlation between market differentiation and enhanced profitability. Figure 2.2, presents a matrix framework integrating both innovation dimensions. The upper-right quadrant, designated as "total innovators", represents retailers demonstrating distinctive capabilities in both product and process innovation. The upper-left and lower-right quadrants correspond to successful process innovators and product innovators respectively, while the remaining quadrant classifies "non innovators", either imitators or those lacking innovation. The model's primary utility lies not in simple classification, but rather in evaluating how competitive forces may erode the distinctiveness of retail innovations within a given market segment [10].

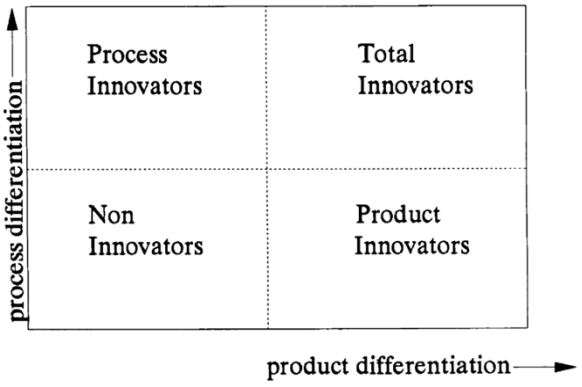

Figure 2.2 — Model of retail innovation (Source: [10])

A common and interesting example is how Amazon adopted the Amazon Go concept as a strategic response to changing consumer expectations in the retail sector. The traditional brick-and-mortar stores (physical stores) were progressively falling short in meeting modern consumer expectations for greater convenience, faster service, and more personalised shopping experiences, therefore changes needed to be made. The main reason behind this innovative approach was to eliminate bottlenecks such as long checkout lines and then ultimately reshape the in-store experience which Amazon Go does by integrating advanced technologies like sensor fusion, computer vision, deep learning, and machine learning to enable a seamless "Just Walk Out" shopping experience [11] [12].

Figure 2.3 — Amazon Go shop (Source: [12])

The implementation of Amazon Go, shop example shown in Figure 2.3, integrated an advanced blend of hardware and software technologies. Upon entering the store using the Amazon Go app, customers are monitored through a network of cameras, weight sensors, RFID tags, and AI-powered analytics that track their interactions with products in real time. When customers take items off the shelf and walk out, the system automatically charges their Amazon account. Technologies such as deep learning allow the system to improve over time, refining product recognition and customer behaviour predictions [13]. Additionally, during the COVID-19 pandemic, the model's no-contact and queue-free setup proved particularly advantageous. A study simulating Amazon Go-like stores under pandemic-related constraints showed that adapting store capacity dynamically based on demand could maximise throughput and efficiency while still respecting public health policies [14].

2.1.4 Future Trends

The rapid evolution of retail innovations highlights the transformative potential of technology in reshaping organisational models. These underscore the need for organisations to adapt their structures and strategies to leverage emerging technologies while addressing consumer preferences and operational efficiencies [9].

2.1.4.1 Artificial Intelligence in Retail

Artificial Intelligence has been gradually integrated into the retail sector and consequently is reshaping innovation across the entire value chain. As retailers adopt AI technologies, they are witnessing transformative changes not only in customer engagement.

Highlighted by [15] , the emergence of what it called the "technology-infused retailing," driven by tools like AI, robotics, and generative AI, is seen with examples such as Amazon and Walmart, that are leveraging chatbots, autonomous checkout systems, and humanoid warehouse robots to enhance operational efficiency and customer service. These innovations allow for faster, more personalised interactions and suggest a future where most employee to customer and backend tasks are automated.

In [16], the authors conducted 23 expert interviews with retail executives and AI vendors to uncover the multi-level (micro, meso, macro) challenges that emerge when retailers adopt AI. Using the Leavitt's Diamond Model as their guide, a model that identifies four interconnected dimensions that determine organisational change, namely people, tasks, structure, and technology, the authors found that for each topic singular outputs appeared. Challenges related to the People dimension of AI implementation in retail emerged consistently across all interviews. These challenges encompassed individuals' knowledge, skills, available resources, and their ability to adapt to new technologies, whether referring to employees or customers. A key concern also centred on the level of trust or mistrust people have in AI systems and their outcomes. Now when it comes to the Task dimension there was a lack of understanding of AI's value and appropriate use cases, as well as difficulties in automating existing processes. Retailers struggled to align AI with tasks, assess cost-effectiveness, and adapt workflows, often defaulting to traditional methods. For the Structure dimension based on participant responses, it was revealed that AI implementation impacts the organisational structure of retail firms in both expected and unexpected ways. Three key structural themes emerged: clearly identifying the problems AI should address, integrating AI collaboratively into existing workflows, and ensuring effective leadership and project management throughout the process. Finally, in the Technology dimension interviewees stated problems that included outdated infrastructure, poor data quality, and system incompatibility. Retailers struggle with integrating AI into existing processes, interpreting outputs, and ensuring usability. Privacy and scalability concern also arise, requiring robust data protection, regulatory compliance, and careful planning to support stable, scalable AI deployment.

On the other hand, when AI systems demonstrate attributes like reliability and empathy, especially in adaptable systems, employees are more likely to respond with innovative behaviours. Following these interactions there's an increase in their sense of job fit and satisfaction, reinforcing AI's strategic role in empowering frontline retail employees to drive service innovation [17].

2.1.4.2 Metaverse and Immersive Retail

First used in 1992 by Neal Stephenson in his novel Snow Crash, the term "metaverse" was back then defined as a virtual place where characters could go to escape a dreary

totalitarian reality [18]. The metaverse now, after years of innovation, offers retailers a pathway to sustainability by enabling value creation through efficient resource use, greater inclusivity, and reduced waste. It mixes augmented and virtual reality (AR/VR), blockchain technology, and now is as emerging as a transformative platform set to redefine industry norms. Merging physical and virtual spaces, the metaverse enables immersive interactions and novel business models, shifting from traditional to virtual commerce. This shift enhances customer engagement, operational efficiency, and sustainability, particularly in retail [19].

In [20], the concept phygital products arises, meaning a combine package that offers a physical product and a digital counterpart, connected through NFTs. For example, buying a sneaker that comes with a matching virtual version for use in the metaverse. These products allow retailers to merge physical and virtual retail strategies, offering operational benefits like lower inventory costs and flexible distribution. Even though this new way of shopping may sound very futuristic and exciting the author found that metaverse-first retailing strategies decrease customer valuations (willingness to pay), even when the phygital product includes the exact same physical and digital components, simply because the digital item is presented first. Additionally, customers perceived these purchases as risky, which lowered their sense of investment value and, in turn, reduced their willingness to pay.

Figure 2.4 — Adidas' metaverse store during Metaverse Fashion Week (29/March/2023) (Source: [20])

Interestingly, luxury fashion brands use the metaverse to enhance brand engagement through NFTs, avatar personalisation, and gamified experiences, rather than replacing physical stores, the metaverse serves as a complementary space for exclusivity and community building [21].

In summary, the question of payment in a metaverse environment is still being explored, revealing that consumers continue to prefer digital wallets over cryptocurrency due to trust and volatility concerns. Security-focused messaging has proven more effective than convenience appeals in increasing willingness to use crypto [22]. Altogether, these findings highlight that trust and immersive value are key to driving adoption in virtual retail environments. The question remains, will we ever fully transition and come to trust the metaverse as a safe and reliable retail space?

2.1.5 Green Innovation

In 2022, according to Eurostat, the EU generated 83.4 million tonnes of packaging waste, or in another way, 186.5 kg per person: paper and cardboard accounted for 40.8%, which remains the largest share of EU packaging waste, ahead of plastic (19.4%), glass (18.8%), wood (16.0%) and metal (4.9%). Since 2011, per capita packaging waste has risen by 29.3 kg; the overall packaging recycling rate stood at 65.4% in 2022. These figures set the baseline for why material efficiency matters. Figure 2.5 shows the per capita trend by material from 2011–2022, highlighting paper/cardboard's consistent dominance [23].

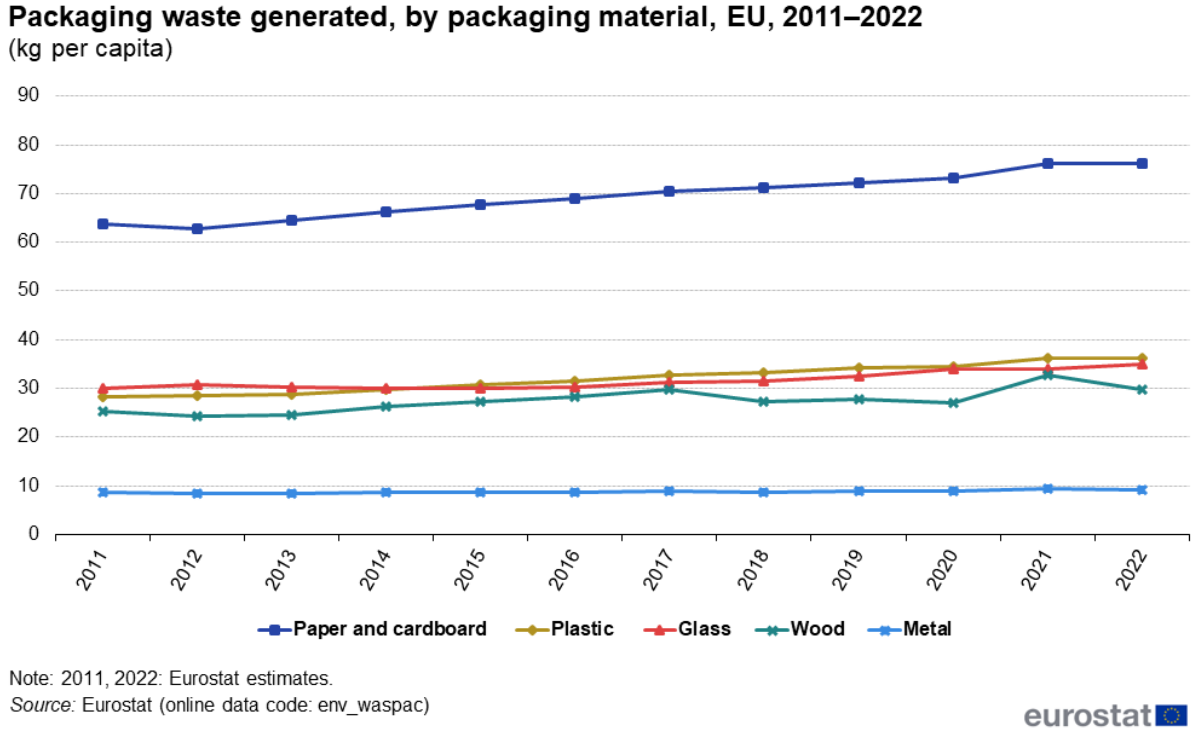

Figure 2.5 — Packaging waste generated, by packaging material (Source: [23])

Within this context, the paperless movement arises as a practical strand of green innovation: it fundamentally dematerialises routine information flows by capturing data at source (e-forms) and retaining auditable digital records rather than printed artefacts that can be lost and harder to be found. [24]. Accordingly, paperless initiatives succeed when digital processes are trusted, well-governed, and embedded in day-to-day work, rather than when paper documents are merely scanned.

Digital solutions now put these changes into practice at scale. Structured e-forms (with validation and required fields), electronic signatures and approvals, version-controlled document packs, and mobile workflows that generate time-stamped audit trails replace print-sign-scan routines. The environmental benefit follows from two mechanisms: direct reductions in paper use and the prevention of rework and reprinting because checks are built into the process. Empirically, this is consistent with evidence that operational digitalisation lowers

emissions: a quasi-natural-experiment study finds that supply-chain digitalisation reduces corporate carbon intensity via technological innovation, eased financing constraints, and heightened external scrutiny [25]. Research on municipal smart waste systems highlights that digital infrastructures carry environmental footprints and governance risks, including energy-intensive data storage and burdensome data management. Paperless initiatives should therefore be paired with device lifecycle policies, renewable powered hosting and data minimisation to secure a genuine net environmental gain [26].

2.1.6 Innovation as a Performative Metric

As unmeasurable as it may seem, innovation can indeed be calculated. The European Innovation Scoreboard (EIS) converts each country's innovation system into a single, comparable score called the Summary Innovation Index (SII). Calculated with the average of 32 indicators grouped into four pillars: Framework conditions, Investments, Innovation activities and Impacts. The 2025 revision updated five indicators to high-speed internet, cloud computing, CO2 and labour productivity, and high-tech import dependence keeping the scoreboard aligned with current policy priorities and new data. Indicators are normalised on a common 0–1 scale (with outlier treatment and transformations where needed) and results are shown relative to the EU (=100; baseline 2018, latest 2025), meaning that, for example if Portugal's score is 95 (indexed to EU=100 in 2018), it performed 5% below the EU baseline in that period. If its 2025 score is 103 (relative to EU=100 in 2025), then right now Portugal performs 3% above the current EU average. Finally, countries are grouped as Innovation Leaders (>125% of the EU), Strong (100–125%), Moderate (70–100%), or Emerging Innovators (<70%) [27] [28].

Turning to Portugal, the 2025 European Innovation Scoreboard classifies the country as a Moderate Innovator, with an SII of 90.7 placing the country at 16th place in the EU. Broadly, Portugal's profile shows strong enabling conditions on the demand side like solid digital infrastructure and skills and a comparatively good conversion of innovation into sales. Public support for business R&D is a clear strength, by contrast, firm-side enablers such as cloud uptake and innovation spending per employee are weaker, which can limit the scale-up of digital transformation in retail [29].

2.2 Information Systems in the Modern Organisation

Fundamentally, an information system is how an organisation makes its work intelligible and actionable as it gathers and shapes data as everyday activity unfolds, preserves what matters and returns it as timely evidence for decisions. Rather than sit in a single department, these systems run through the enterprise as a distributed network that links shop-floor tasks to managerial oversight and strategic direction [30].

This subchapter examines the foundations that structure information flows within organisations. It first clarifies the five core system types referenced throughout the thesis: Transaction Processing Systems (TPS), Office Support Systems (OSS), Management Information

Systems (MIS), Decision Support Systems (DSS) and Executive Information Systems (EIS), with emphasis on their purposes and typical outputs. These systems are then situated within a five-level information-system pyramid to trace how data captured at the frontline is transformed into managerial information, analytical insight and executive oversight, while goals and controls cascade back towards operations.

2.2.1 Types of Information Systems

Information systems are now central to organisational life. This subchapter introduces the core types found in practice, from transaction processing at the front line to executive information at the top [31].

2.2.1.1 Transaction Processing Systems

TPS are critical for businesses because they manage the recurring transactions required for business operations at an organisational level. They capture routine events as they occur, validate and update records, and keep company data current either in real time or in scheduled batches. The result is a reliable record of operations and standard summaries that other systems use for control and analysis. Because day-to-day work depends on this, any outage in the TPS can disrupt the organisation [31], [32], [33].

2.2.1.2 Office Support Systems (OSS)

OSS are information systems designed to support day-to-day work across the organisation. Helping employees to create, store, manage and communicate information efficiently, coordinate workflows and approvals, maintain version control, and keep procedures easy to find. These systems facilitate collaboration and communication among teams and employees, enabling activities such as electronic mail, video conferencing and file transfer. In practice, OSS sits between event capture and management reporting: it organises the work that turns raw events into controlled, auditable records and makes retrieval straightforward when checks or audits are required [31], [32].

2.2.1.3 Management Information Systems (MIS)

Management Information Systems provide managers with information that is timely, reliable, understandable and easy to access so that day-to-day control runs smoothly. They are built on data captured by transaction systems and turn it into usable evidence by sorting and merging records and then summarising them, so managers can compare current results with earlier periods or with targets. When a question requires deeper analysis, MIS connects with decision support and knowledge-based tools to extend the enquiry. In short, MIS sits between operational processing and managerial oversight by transforming raw activity into usable evidence for short- to medium-term decisions [31], [32].

2.2.1.4 Decision Support Systems (DSS)

Decision Support Systems are computer-based systems that help managers deal with complex and changing decisions. They combine data from inside the firm and from external sources with models, simulations and analytical methods to explore alternatives, test what if questions and forecast likely outcomes. Unlike MIS, which deliver routine summaries for control, a DSS is interactive and tailored to the question at hand so the user can make better assumptions and see the impact immediately [31]. In practice, a DSS turns detailed records from TPS and MIS into insight that support important decisions such as planning a launch, setting a price, or designing a logistics plan. Essentially, these systems improve the quality and speed of decisions, increase confidence in the chosen option and help organisations explain and justify their actions [32], [34].

2.2.1.5 Executive Information Systems (EIS)

Executive Information Systems give senior managers fast access to the signals that matter. They bring together data from inside the firm and from external sources, summarise it, run simple simulations, and let the user drill down when something needs attention. The outputs are clear views, summaries and forecasts that support unstructured decisions and longer-term choices. EIS are designed for ease of use and can be tailored to an executive's needs, though many enterprise systems also offer configurable EIS modules. In practice, they sit above MIS and DSS, drawing on their data and models while concentrating attention on a small set of priorities and trends [31], [32].

2.2.2 The Information System Pyramid

The pyramid model shows how information flows and is used at different organisational levels [32].

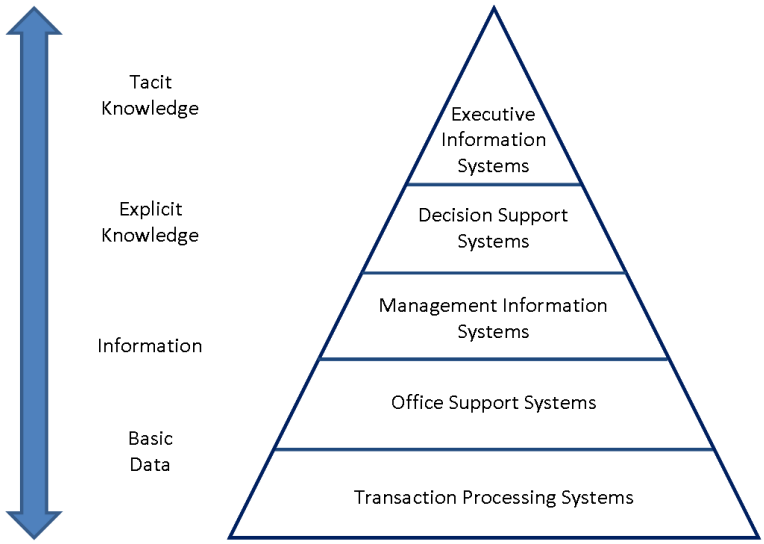

Figure 2.6 — Five level pyramid model for Information Systems (Source: [32])

The layered view presented in Figure 2.6 is useful because it is simple to understand and helps place each information system at the right level.

2.2.3 Role of IS in Business Strategy

Information systems bring strategy to life by influencing the way work gets done and outcomes are perceived. Value is increased by aligning the IS portfolio specifically with business objectives and facilitated by strategic IS planning and governance [35].

Operationally, the chain runs from capture to oversight: transactions are recorded, routine work is coordinated, results are summarised for control, options are explored with models, and executives focus on the few signals that matter. A classic treatment makes the vertical linkage explicit, as simple as, the lower layers feed the upper ones, which is why reliability at the base is a precondition for good analysis and oversight [34].

Modern platform architectures accelerate this loop by standardising data exchange and exposing services through APIs. Platforms connect participants and shorten the path from event to decision and from decision to action, this platform logic increasingly underpins competition and scale through ecosystems [36].

The payoff is conditional on context for big-sample evidence which reveals that IS's effect relies on the industry's IT's strategic role of IT: Automate, Informate or Transform, with cost leadership fitting best in Automate environments, differentiation in Informate/physical-transform environments, and dual strategies where digital-transform logics dominate [37].

Finally, IS strategies of the enterprise aid innovation because of decision quality and process performance; their influence is indirect, operating through superior decisions and better processes, not just via technology [38].

3

EMPLOYEE-DRIVEN INNOVATION (EDI)

Innovation is no longer confined to Research and Development departments. Many organisations now tap into the creativity of employees and encourages them to contribute with ideas and improvements. This collaborative approach shifts the responsibility for innovation beyond formal roles, turning everyday work into a source of valuable change and development and from here Employee-driven Innovation emerges [39].

Even though the term employee-driven innovation is relatively recent, the underlying concept has been well established for some time under alternative designations, such as shop-floor innovation for example. The growing interest in EDI stems from the recognition that shop-floor employees possess valuable experience and insights gained through their daily work, positioning them as key contributors to organisational and technological change, improved efficiency, and the development of new solutions [40], [41].

3.1 Types of Employee-Driven Innovation

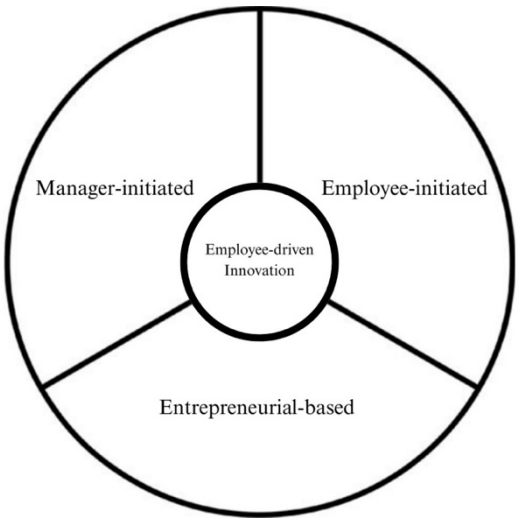

Figure 3.1 — Types of EDI

The EDI concept often appears in three distinct forms, as displayed in Figure 3.1. The first can be denominated Manager-initiated EDI, where leaders create structured environments that encourage employees to contribute ideas and when managers themselves introduce innovations aimed at improving the work experience and overall satisfaction of their teams. The second is Employee-initiated EDI, where workers naturally collaborate to improve their work environment without formal prompts. The third involves Entrepreneurial-based EDI, where employees act as user-innovators, contributing ideas that result in entirely new offerings. These forms demonstrate how EDI can originate from different levels of an organisation and lead to meaningful innovations across operations, culture, and market offerings.

A clear example of manager-initiated EDI is usually seen at ICT (Information and Communication Technology) companies like Microsoft and Google, where higher roles actively create structures for employee innovation. Microsoft's "ThinkWeek" and internal testing programs, such as dogfooding, involve employees in product development, while Google's "Innovation Time Off" allows staff to pursue personal projects that have led to major launches like Gmail [42]. These initiatives succeed because management provides autonomy, support, and recognition, creating a culture where innovation is encouraged and systematically integrated into company processes while asking for active feedback from their own employees.

A case study from a home appliance validation lab illustrates Employee-initiated EDI clearly as operators who used outdated and inefficient software organised a focus group to outline challenges and suggest specific improvements. Their proposals were based on daily operational struggles and directly informed the system's redesign, which were mainly for automating data entry and to introduce portable devices. This example highlights how innovation can emerge organically from frontline employees when they are empowered to reflect on their own work practices and contribute to improving them and their satisfaction [43].

A particularly famous example of entrepreneurial-based innovation is the story of Richard Montañez, a former janitor at Frito-Lay who revolutionised the snack industry. Drawing inspiration from Mexican street food, he experimented by adding chili powder to plain Cheetos and successfully pitched the concept to company leadership. This bold idea gave rise to Flamin' Hot Cheetos, which then became one of the brand's most profitable products, demonstrating how employees at any level can drive developing change [44].

These cases all show that employee-driven innovation can emerge from different sources, but successful implementation can often depend on a company's culture and management approach. A study of Norwegian enterprises emphasizes that the most successful EDI efforts occur when employees are granted autonomy and managers act as facilitators rather than controllers. In these environments, trust, openness, and shared responsibility are key. Middle managers now serve as the bridge between strategy and execution, creating an environment where employee-driven innovation can flourish by fostering open communication, minimising bureaucratic barriers, and demonstrating genuine leadership support, they help transform grassroots ideas into tangible value. Unlike superficial suggestion programmes, true innovation emerges when organisations treat EDI as a cultural mindset rather than an initiative, one where every employee feels empowered to contribute [45].

3.2 Drivers for EDI

3.2.1 Organisational Culture

Playing an essential role in promoting EDI, the culture within an organisation shapes the environment in which employees feel encouraged to share and develop new ideas. A culture that values collaboration and continuous improvement nurtures empowerment and trust, crucial conditions under which employees are more likely to take initiative and contribute to innovation. As highlighted by [46], such a culture provides psychological safety and clarity of purpose, making innovation part of everyday work. Empowerment further strengthens employees when they are recognised for their own efforts, even symbolically, which reinforces their motivation to innovate [47]. Additionally, as mentioned in [48], a culture that promotes workplace learning, through formal training or peer-to-peer exchanges, equips employees with the skills and confidence needed for innovation.

3.2.2 Motivation

Divided into two complementary sources, intrinsic and social, motivation also plays an important role as an EDI driver. The first one referring to an employee's internal drive to engage in innovation out of personal interest, curiosity, or satisfaction and the latter arising from the desire to contribute to others and improve collective outcomes. Both forms significantly enhance employee involvement in digital innovation, especially when innovation is not part of formal job duties [46]. This is also supported by [48] who link intrinsic motivation to employee's emotional engagement and creativity, which are core components of innovative behaviour. Together, these motivational factors energise employees to generate, propose, and implement ideas that lead to meaningful organisational improvements.

3.2.3 Strategic Alignment (Perpetual Challenge)

When a company makes innovation a core part of its strategy, employees see their ideas as more valuable and worth pursuing. Research by [46], shows that strong leadership support for innovation, backed by clear strategic goals, drives employees to actively participate in the process. This idea aligns with what [48] describe as a culture of perpetual challenge, one where teams are constantly testing new approaches, solving problems creatively, and taking smart risks. In such an environment, employees stay driven to improve their work and adjust to shifting priorities. Over time, this mindset ensures that their innovative efforts directly contribute to the company's future success.

3.3 Barriers to EDI

3.3.1 Lack of Time and Workload Pressure

As with any organisational process, while EDI relies on strong drivers, it also faces significant barriers, one of the most persistent being lack of time and workload pressure. In [49], that is illustrated in their study of a regional bakery, where tightly scheduled shifts and production demands inhibited employees from engaging in reflective or collaborative innovation. Similarly, [47] found that retail employees, though willing to contribute ideas, were overwhelmed by operational responsibilities, leaving innovation deprioritized in the face of immediate tasks. These studies reveal how organisational systems that prioritize efficiency and routine inadvertently suppress the emergence of bottom-up innovation. The findings underscore that fostering EDI requires more than encouraging participation, it necessitates structural accommodations such as protected time and reduced workload pressure to create the conditions under which innovation can genuinely occur.

3.3.2 Rigid Organisational Structures

Here, organisational culture can also act as a barrier for EDI, when it reinforces rigid structures that limit autonomy, communication, and collaboration. Rather than promoting openness and experimentation, hierarchical systems often prioritize control and predictability, leaving little room for bottom-up innovation. In [50], it is highlighted how hierarchical healthcare settings hinder workforce-driven innovation by suppressing junior employees' contributions and reinforcing status-based silos. In both contexts, innovation is confined to formal decision-makers, sidelining frontline workers who are best positioned to identify practical improvements. These rigid structures not only reduce the flow of ideas but also erode psychological safety, ultimately undermining the very culture of innovation organisations aim to cultivate.

3.3.3 Top Management

Just like the previous point, top management can also act as either a catalyst or a constraint for EDI, and when leadership fails to empower, it becomes a major barrier. While innovation thrives under empowering leadership that encourages autonomy, risk-taking, and employee input, many top managers instead cling to control, and bureaucratic rigidity. In such environments, employees lack not only the authority but also the confidence to initiate new ideas. According to [51], empowering leadership cultivates innovation by sending strong signals that employee ideas are valued and that risk-taking is supported. Conversely, when leaders fail to provide these signals, or worse, discourage participation, they stifle innovation at its root. This misalignment between leadership behaviour and organisational innovation goals is especially harmful in SMEs, where the proximity between staff and leadership should ideally foster agility and trust. Bad leadership doesn't just fail to drive EDI; it actively blocks it.

3.4 Theoretical Framework for EDI

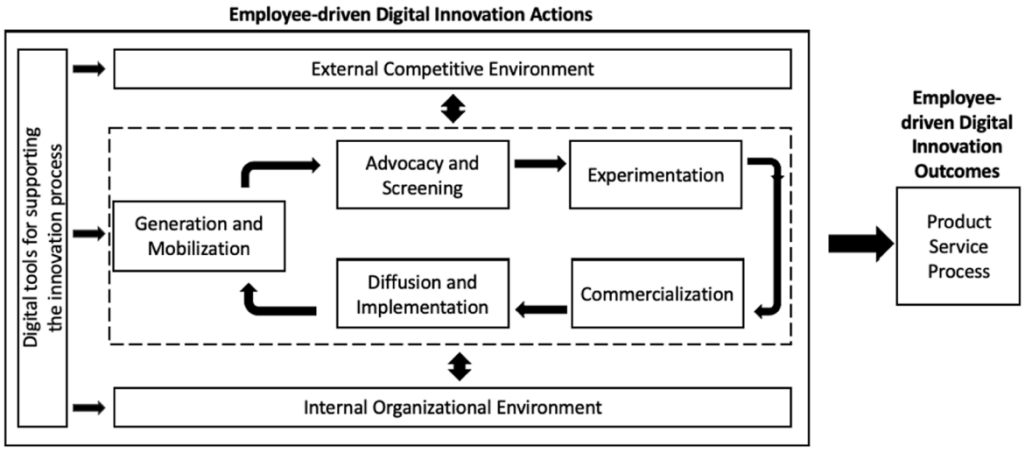

Figure 3.2 — Theoretical framework of employee-driven digital innovation (Source: [60])

Combining both EDI and digital innovation, Figure 3.2 shows a theoretical framework developed in [52]. Building upon earlier studies on employee-driven innovation in [53] and [54], intrapreneurship in [55], and digital innovation by [56], this work introduces a theoretical framework to conceptually define and structure the notion of employee-driven digital innovation.

Their study aims to examine innovations initiated by “ordinary employees” as they engage with opportunities available within their organisational contexts. To capture this process, it adopts the phase-based approach of intrapreneurship, integrating it with established theories from both employee-driven innovation and digital innovation. The resulting theoretical framework is structured around the stages outlined in [55]. These phases are influenced by both internal and external elements associated with digital innovation activities, as outlined in the digital innovation framework [56]. The integration of intrapreneurial stages presented in [55] into this model enables a more comprehensive understanding of how employee-driven digital innovation unfolds within organisational environments.

The proposed framework introduces an additional explanatory component that is not addressed in the models of [55] or [56], which is, the role of digital tools in facilitating and supporting employee-driven digital innovation. This inclusion of digital tools, such as those used in ideation systems, is a recurring theme in the literature on employee-driven digital innovation, particularly within the field of information systems, as referred in [57]. One of the key benefits of digital tools is their ability to enhance the efficiency of the innovation process; additionally, they can address several challenges commonly encountered within intrapreneurial innovation activities.

The primary objective of Opland’s theoretical framework is to enhance understanding of employee-driven digital innovation by illuminating both the actions involved and their resulting outcomes. In doing so, the framework supports research in the field by offering clarity on the underlying processes, thereby avoiding the tendency to treat employee-driven digital innovation as an unexplained, sort of "black box" [52].

The model outlines several distinct phases. *Generation and Mobilization* refers to the initial stage, in which ideas are conceived, and early support is gathered. *Advocacy and Screening* involve evaluating and selecting ideas with potential for further development. After that comes *Experimentation*, which focuses on identifying appropriate technologies and shaping the proposed solution. In the *Commercialization* phase, the selected idea is refined into a viable and usable outcome. Finally, *Diffusion and Implementation* pertain to the broader deployment and integration of the innovation within the organisation. While *digital tools* can enhance and facilitate each phase of the process, their use is not a prerequisite for the occurrence of employee-driven digital innovation.

4

Frameworks for Value, Needs, and Applicability Assessment

4.1 Value Proposition in Digital Solutions

4.1.1 Defining the Value Proposition

Value proposition identifies why an offering is worth taking up by specific actors. It is at times considered a cross-functional construct within strategy and marketing that bridges positioning and execution. It is considered within this thesis as a strategic tool for expressing how an organisation gathers and leverages its resources to provide a superior value package to identified customers, therefore implying that this view emphasises a clear promise of value, a defined audience, and the comparative nature of the claim. It also treats the value proposition as dynamic rather than a slogan, since it connects intent with delivery and performance in context [58].

In digital solutions and information systems the value proposition is best understood as a socio-technical claim, linking specific capabilities such as data capture, automation, analytics, integration and collaboration to value in use for identifiable actors within a network. More than a customer-facing message, it becomes an organising argument about outcomes once the system is embedded in real work. The industrial marketing literature situates value propositions in digitally transformed value networks and highlights actor-to-actor resource integration and stakeholder centric perspectives that matter for enterprise systems [58]. The innovation management literature adds that firms often hold a portfolio of propositions aimed at different external stakeholders such as users, buyers, investors and resource owners. These propositions both enable transactions and attract complementary investment that strengthens the digital offer over time [59].

Quality and fidelity of a value proposition shape adoption, diffusion and benefit realisation because they decrease uncertainty regarding who benefits, how benefit is generated and what needs to hold for it to come about. Clearly expressed propositions coordinate expectations and harmonise change within webs of actors rather than single buyer-seller relationships [58]. In scaling or early settings, they fortify the organisation's capacity to scale, stimulate

demand and attract outside resources which co-create or enhance the offer, which facilitates diffusion beyond pioneers [59]. Sustainability scholarship additionally emphasises that organisations need to make and deliver on their promise within a constellation of parties and forms of value, which is particularly true in public, health and learning settings where social and environmental value as well as economic value are present [60]. Theoretically this underpins the proposition that a value proposition is an argument about future value in use where perceived benefits and sacrifices are fluid, situationally contingent and co-constituted as systems are introduced [61].

Reflecting industry to industry, digital value propositions all converge on a limited set of outcome categories: more efficiency at reduced cost; superior quality and safety; reduced cycle times and responsiveness; enhanced compliance and auditability; superior user experience; enhanced visibility and co-ordination; better decision-making through data and analytics. These outcomes indicate a move from value in exchange to value in use and an outside-in perspective that begins with experienced effects by actors and works back to features., whether this promise realizes benefits is subject to boundary conditions typical of information systems. [58]. Data quality and data governance are central because poor or inconsistent data weakens decision-making quality, visibility and compliance [60]. User capability and change support through adoption, training and process design are similarly preconditions to value in use; without them the proposition is rhetorical even where technology is sound [59].

4.1.2 The VCW Method

The Value Creation Wheel (VCW) was introduced by Prof. Luís Filipe Lages to move beyond linear, trade-off approaches and help organisations handle competing demands by exploring widely and then narrowing decisions systematically. The foundational article in the Journal of Business Research positions VCW as a stakeholder-centred decision framework created to cope with uncertainty, reconcile market-pull and technology-push tensions, and connect strategy to implementation across contexts [62].

Figure 4.1 — Value Creation Wheel Logo (Source: [72])

Subsequent books consolidate and extend the approach, documenting its evolution and use in multi-actor settings where transparency, alignment and traceability from options to actions are required [63], [64]. VCW materials also document a broad base of adopters; examples listed publicly include Airbus, AstraZeneca, AXA, Credit Suisse, Cathay Pacific Airways, Mastercard, SL Benfica and UPS, and universities such as MIT, Nova School of Business and Economics, and Marseille University [65].

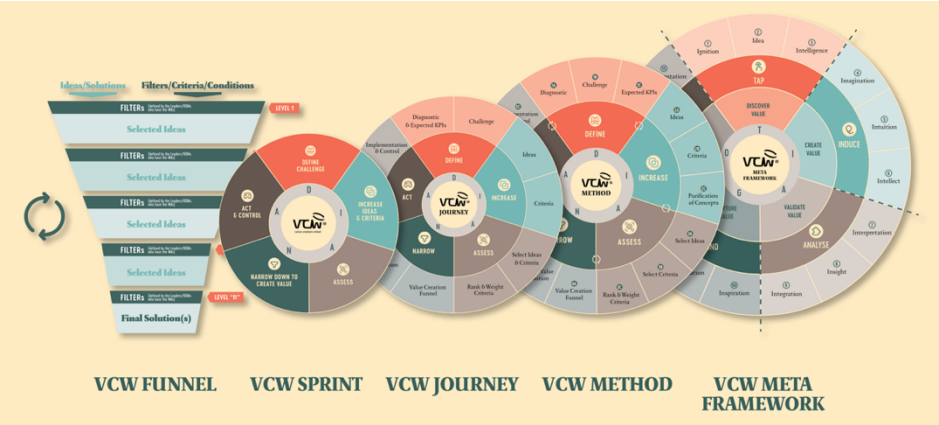

Figure 4.2 — Diagram variety inside VCW (Source: [72])

Within the VCW family there are two complementary layers. DIANA provides the theoretical backbone that structures problem solving into five phases of divergence and convergence; TIAGO is the practitioner-facing meta-framework that operationalises those principles with a toolbox of methods tailored to the resources and constraints of a given challenge. In short, DIANA explains the logic, while TIAGO packages and applies it. The meta-framework literature states that VCW encompasses both, with DIANA variants (e.g., Sprint, Journey, Method) analysed separately and the TIAGO VCW Meta Framework guiding real decisions by Key Decision Makers while making explicit the 4Ms constraints of Manpower, Minutes, Money and Motivation, [63], [66]. This thesis will later employ DIANA to structure need identification and decision making.

In that application, the VCW "funnel–tunnel" logic is central. The VCW Funnel is the method's tactical filtering mechanism for small, time-boxed challenges: it frames a single challenge, mobilises the right stakeholders within 4M limits, and converges quickly from many ideas to a feasible shortlist. It is deliberately lightweight, iterative and adaptable when compared with the broader VCW Meta Framework used for complex, longer-run problems [63], [64], [66].

Operationally, the Funnel keeps two streams separate, which are, the candidate solutions and the acceptance/rejection criteria ("filters"). Ideas are expanded, filters are derived and ranked, and the ranked filters are applied transparently to narrow alternatives. Discarded ideas are parked for later cycles; shortlisted options are developed to concept or prototype for a Go/NoGo/Check decision. The process remains structured yet flexible, preserving traceability from stakeholder inputs and criteria to the final choice and the path to implementation [63], [64], [66].

4.1.2.1 A value proposition in the eyes of the VCW

In the VCW Meta Framework, a value proposition is the clear statement of why a customer would choose one offer over competing alternatives. Formally, it is a promise of value that must be delivered and communicated in a way that makes the benefits unmistakable, turning the proposition into a central reference for marketing choices and wider decision-making. Because customer attention is scarce, the message should be concise without losing credibility, and it should quickly convey what is distinctive about the offer; A.I. tools may support drafting and evidence without weakening the underlying claim [66].

The framework positions the value proposition as the output of a short, purposeful sequence. One begins by defining the customer problem, validating that it is genuine and worth solving, and only then drafting the proposition. Drafting follows three ingredients: state the benefits and for whom they matter; link those benefits directly to how the solution addresses the problem; and make explicit why the offer is better than available alternatives. VCW also suggests a compact architecture: a brief captation stating the central benefit, a short explanation that identifies the target, the relevant differentiation and complementary benefits and finally a concise proof points or visuals that underline the benefits and their connection to the product or service. Effective propositions are relevant to the intended audience, clear in meaning, and immediately understood, however, the framework warns against confusing the value proposition with brand strategy, positioning, or a slogan, which serve different roles in the broader strategy stack [66].

4.2 Frameworks to Identify Customer Needs

4.2.1 The challenge of capturing IS needs in unfamiliar contexts

Finding the requirements for an information system in an unfamiliar area is exceptionally hard not only because they depend on people and technology but because they are changing as you learn. Traditionalist reasoning holds they are elicited and not gathered. Stakeholders' goals, constraints and perceptions evolve jointly as interrogation advances, and diverse views need reconciliation beyond organisational boundaries [67]. In new environments the analyst confronts tacit work processes, local variation and domain idioms which render early proclamations of 'what is needed' ephemeral; premature convergence risks embedding assumptions from diverse environments. To cope with this uncertainty, the choice of method must be considered carefully and an extensive survey demonstrates that elicitation methods reveal different aspects of need: interviews reveal intentions, observation reveals latent routines, workshops create shared terminology, and document analysis ground terminology, so no single method covers the ground [68]. In combination, these rationales support the application of a structured, staged approach to need identification in unfamiliar industries, an approach which accepts uncertainty early and gradually refines requirements by evidence and cross-checks, not assumptions [67], [68].

4.2.2 Why structured frameworks reduce bias

Structured frameworks are key, because they provide a common vocabulary and an unambiguous method of organising evidence prior to making judgements about options. Frameworks are worth the endeavour of synthesising ideas and organising inquiry, if their end and use in action are made explicit; otherwise, they become vague "black boxes" obfuscating assumptions and tempting unexamined decisions. Using the framework as a transparent scaffolding in delineating its end, the ideas used, and the procedure of aggregating and weighting evidence, limits first idea anchoring and confirmation bias of pre-existing perceptions. It also serves to communicate among stakeholders by making the criteria explicit and reproducible.

Frameworks are shaped by the positionality of their creators and can steer both questions and outcomes unless the conditions of their development and use in the field are actively examined. For this reason, the thesis integrates the structuring of frameworks with reflective application, maintaining explicit criteria, transparent reasoning and continual comparison of results against the problem under consideration. [69].

4.2.3 The DIANA process

DIANA underlies the Value Creation Wheel (VCW) theoretically. It frames problem solving as a circular, adaptive sequence alternating between divergence and convergence to deal with uncertainty and competing constraints. The five steps are usually depicted sequentially, but implementing need not be linear, and groups may cycle back as evidence and context change, maintaining transparency in the way ideas and the criteria change over time.

DIANA views decision making as an interactive cycle that blends creativity and systematic evaluation and deliberately synthesises inputs from stakeholders inside and outside the organisation. It formally distinguishes generation of ideas from judgment to counteract pitfalls of traditional brainstorming, focusing on an iterative, stakeholder-driven approach [67].

4.2.3.1 The Five Phases

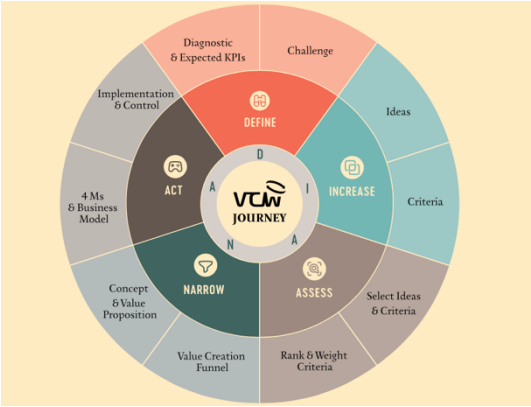

Figure 4.3 — DIANA Framework wheel diagram (Source: [72])

Beginning at the DEFINE stage the Key Decision Makers define the problem in clear and operable terms, confirm the resource ceiling by the four Ms: manpower, minutes, money, and

motivation and agree the measures of success that will subsequently serve to anchor monitoring. The deliverable is a one-sentence "How to…?" question underpinned by a concise diagnostic and preliminary list of stakeholders. While given importance initially, this definition can be updated if later evidence proves that scope or measures of success were mis-specified, because in DIANA one can move between stages as one's understanding changes [62], [63].

INCREASE broadens the search space intentionally prior to making any judgement. The VCW team, the KDMs and other important stakeholders jointly generate a longlist of options and an accompanying parallel longlist of candidate criteria, commonly augmented by artificial intelligence to increase coverage. The rule here is variety rather than verdicts, with contributions which are captured faithfully such that promising ideas and limitations are not lost when the process subsequently converges. In practice, this stage reveals bottlenecks and enablers that will constitute the cornerstones of the decision rules in the subsequent phase [62], [63].

In ASSESS the filters are translated from the longlists to decision architecture. KDMs identify the ideas worth pursuing and frame the filters that will determine choice. DIANA separates the compulsory filters, ranked because they are imperatives, from the optional filters, weighted to make trade-offs explicit. Stakeholders can participate in this stage to test feasibility and fairness, but responsibility for the filter configuration goes to the KDMs who have the mandate and access to the four Ms. The deliverable is an explicit shortlist plus a written set of ranked compulsory and weighted optional filters that will motivate the subsequent narrowing [62], [63].

NARROW then applies the decision rules to the options narrowed down. Any idea that fails to pass through a required filter exits. The remainder are challenged against each other in the optional weights so the optimum-fit solutions rise to the top without ad-hoc judgement. Where appropriate, options are bundled, concepted, or prototyped so filters can be applied to something tangible. The step then often emerges low-cost, high-impact bundles once feasibility, time to value, risk and acceptability by the stakeholders are considered in the light of the filter set [62], [63].

Finally, ACT operationalises what remains**.** KDMs re-validate the four Ms, assign owners, and launch with milestones and the agreed indicators. Monitoring is integral rather than an afterthought. Results may trigger loops back to earlier phases to adjust assumptions, filters or solution design. Published applications in health and public sector settings illustrate this rhythm: challenges are framed, participation and access constraints are expanded into ideas and filters, shortlists and criteria are structured, priorities are chosen under the ranked and weighted rules, and implementation is tracked to measurable outcomes such as shorter emergency waiting times or higher screening participation [62], [63].

Throughout all five stages the reasoning is the same. DIANA distinguishes divergence from convergence, records criteria that determine choice, and puts decision rights at the centre of KDMs who can bring resources to bear and do something. It does not regard stakeholder consultation as decoration but as method and it does regard iteration as the norm. That blending of openness up front and discipline later makes it possible for teams to progress from loose brief to manageable action with a traceable line of thought [62], [63], [64].

4.2.3.2 Role and core elements

The Key Decision Makers (KDMs) are the individual/group leaders who are obliged and have access to the 4Ms to tackle the challenge at organisational/personal level. During DIANA they: specify the problem and KPIs (Define); are the champions for broad idea and filter generation (Increase); select ideas and formalise obligatory/facultative criteria (Assess); approve priority determination (Narrow); and commit resources and direct implementation (Act). [63].

The DIANA process is by design participative: internal and external stakeholders jointly generate ideas, reveal constraints, co-design filters, and assist in implementation as the wide participation increases informational diversity, feasibility, and legitimacy of the ultimate decision. [63].

4.2.3.3 Illustration in practice: Self-Care Clinic

The VCW4Health materials present a Self-Care Clinic vignette that traces DIANA end-to-end and explicitly notes its status as a theoretical simulation developed in University of Évora workshops to validate the approach. The KDMs first define the challenge: "How to motivate healthcare students to voluntarily collaborate in the Self-Care Clinic?" and confirm resources and success indicators. In increase, contributions from the VCW team, KDMs and stakeholders expand the search space: the core bottleneck is student engagement, so the idea longlist emphasises measures that raise participation alongside a parallel longlist of candidate filters. During assess, the KDMs select promising options and structure the filters: compulsory conditions (e.g., feasibility within curricular time and institutional constraints) are ranked, while optional criteria (e.g., recognition value, breadth of applicability) are weighted. In narrow, stakeholders apply these rules to the shortlist, prioritising interventions that are sustainable, broadly applicable, and provide visible recognition, such as mentorship programmes, flexible volunteering formats, and recruitment events. Finally, act translates the bundle into implementation steps: allowing flexible choice of areas within curricular units, introducing digital tools, and instituting a recognition system, embedded in a university–community–health services collaboration [64].

4.2.3.4 Benefits and outcomes

One of the most important characteristics of the framework is its transparency and traceability. Ideas, filters, rankings and weights are logged, making the reasoning auditable and teachable. Also, bias is addressed early as DIANA separates open ideation from disciplined filtering and applies public criteria that curb anchoring and drift. The process is adaptive, running in cycles so teams can revisit choices as evidence develops. It also builds alignment through formal co creation with key decision makers and affected actors, improving acceptance and execution quality. The approach scales from individuals and start-ups to NGOs, SMEs and large organisations, working best where resources follow the 4Ms and decision rules are explicit. [62], [63].

4.2.3.5 Position within the VCW family

With the VCW approach, the lighter approaches are favoured by DIANA (VCW Sprint, Journey, Method). The teams will start using a VCW Funnel for quick scoping and then, where resources/complexity demand it, switch to DIANA-based working; heavily customised, lengthy projects will perhaps end up using the TIAGO Meta Framework subsequently. This puts DIANA without extending the conversation beyond it. DIANA translates a wide brief into usable action by iterating through Define, Increase, Assess, Narrow, Act. Its openness in the early going and disciplined, criteria-driven convergence in the late going enable defendable, stakeholder-agreed decisions that can evolve as circumstances shift [66].

4.3 Evaluating the Fit of Digital Systems

4.3.1 QFD Fundamentals for IS

Quality Function Deployment (QFD) was born in Japan in the early 1970s as a structured, customer-centric planning approach to "design in" quality rather than detect defects downstream. It began with Yoji Akao's codification of quality tables at Kobe Shipyards, a shipbuilding company, in 1972, and grew within company-wide quality control as a mechanism to translate the voice of the customer into technical attributes that guide product planning, design, process development, and production [70]. The approach spread worldwide in the 1980s and was popularised in the United States by Hauser and Clausing's "House of Quality," a graphical representation that structures customer requirements and engineering responses and is widely considered QFD's first and most emphasised phase [71]. Over the years, QFD was adapted from manufacturing to services and information systems and enhanced by methods such as AHP-QFD and fuzzy QFD to address weighting and uncertainty while retaining its fundamental intention: making customer priorities explicit, traceable, and influential across development [70], [71], [72].

QFD is normally deployed as a cascade of four interconnected matrices. Each phase's output becomes the structured input to the next, maintaining traceability from customer priorities to shop-floor controls. Phase I converts customer requirements ("WHATs") into technical characteristics ("HOWs"); the prioritized HOWs become the WHATs of Phase II, and then on through process and production planning [70]. This stepwise connection is the logic behind the well-known cascade of QFD charts, shown in Figure 4.4.

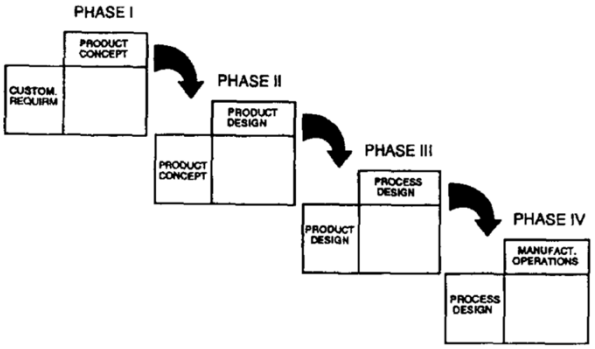

Figure 4.4 — Cascade of QFD charts (Source: [78])

Phase I — Product planning / product concept. Teams select customer segments and elicit, structure, and prioritize requirements; they define quantifiable technical characteristics that can satisfy those requirements and evaluate relationships between each WHAT and each HOW. This preliminary matrix is most commonly called the House of Quality; it yields ranked technical priorities and, where feasible, target levels and competitive comparisons [70], [71].

Phase II — Parts (or features) deployment. The prioritized technical characteristics from Phase I are decomposed into key part/feature characteristics. The purpose is to specify critical-to-quality attributes at the component level so that satisfying them will deliver the system-level technical responses defined earlier [70], [71].

Phase III — Process planning. Key part characteristics are converted into process parameters and controls (e.g., tolerances, capability needs, process flow, and resources) that will realize the parts consistently in manufacture. This maintains the WHAT to HOW logic at the process level and lays the groundwork for operations planning [70], [71].

Phase IV — Production (manufacturing operations) planning. Process parameters are translated into specific operating instructions, inspection and control plans, and resource assignments on the shop floor. This final matrix closes the chain from customer needs to actionable work, enabling feedback and control and keeping decisions aligned with earlier priorities [70], [71].

QFD connects the voice of the customer to early technical decisions, building a cross-functional language that clarifies trade-offs and minimizes downstream rework. As a formal substitute for ad hoc decision making, it helps teams balance “what customers want” against “what the company can build” and facilitates organisational learning [70].

The flexibility of the method has also enabled its application across strategic and operational decisions in a wide range of industries, supported by extensions such as AHP-QFD and fuzzy QFD to handle weighting and uncertainty while preserving the core customer-centric logic [71], [72].

4.3.2 The House of Quality

The House of Quality (HoQ) is the Phase-I artefact of QFD that organises, in a single matrix, the linkages between customer requirements and technical or system characteristics and then turns those linkages into prioritised targets. In its canonical layout, the left side lists the customer requirements (the "WHATs") together with their importance ratings; the top lists the technical or system characteristics (the "HOWs") expressed as measurable variables; the central body is a relationship matrix that records the strength of connection between each WHAT and each HOW; the roof maps positive and negative correlations among HOWs; and the lower/right panels consolidate technical priorities, targets ("how much"), and, where useful, competitive and difficulty information [70], [71].

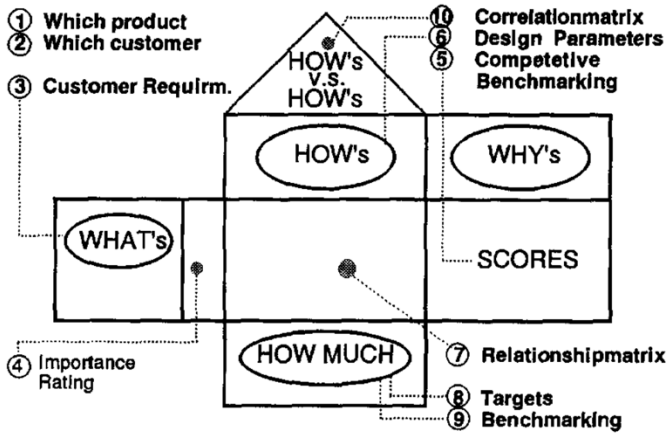

Figure 4.5 — The HOQ showing the "rooms" of the various steps in the QFD process (Source: [71])

Construction of the HOQ proceeds in a disciplined order. Teams first scope the project and determine the appropriate customer segments, then extract the WHATs and organize them (frequently hierarchically) such that overlapping or excessively fine items are consolidated or grouped. Each requirement receives an importance rating and may be complemented by customer/competitor judgments in a planning matrix. The HOWs are then specified at a level firm enough to be shaped by design or configuration, and each HOW should contain a unit and a direction of goodness (increase/decrease/target) to facilitate later target-setting. A consistent relationship scale is agreed by the team, typically $0/3/9$ and the strength of linkage assessed for each WHAT–HOW conjunction. Technical priorities for attribute j are then calculated as the weighted sum of its relationships to the WHATs with the following formula:

$$\mathrm{PRIORITY}(\mathrm{HOW_j}) = \Sigma_i \mathrm{IMPORTANCE}(\mathrm{WHAT_i}) \times \mathrm{RELATIONSHIP_{ij}}$$

Sometimes priorities can be normalized to percentages for ranking. Synergies (positive correlations) and trade-offs (negative correlations) appear in the roof to avoid double counting and highlight conflicting targets early. Lastly, target values for key HOWs are specified, and optional difficulty or risk ratings may be noted to balance benefit with feasibility before progressing to downstream deployment matrices [70], [71].

5

CHARACTERISING THE SYSTEM

For confidential reasons, most of this chapter was omitted.

5.1 The DRS's Value Proposition

To address RQ 1.1, "What is the DRS's value proposition?", we return to the theoretical study on value propositions. There, the VCW framework provides a practical guide to building a clear and credible value proposition.

Following VCW, the value proposition comprises three parts. First, the captation: a short sentence that conveys the central benefit, distinct from a slogan. Secondly, the paragraph: a brief statement that identifies the target, the differentiation and the key benefits. Finally, an illustrative section that uses bullet points, images, video or an infographic to underline the main benefits and show how they link to the product.

The value proposition should be a promise of value that is delivered and communicated in a way that makes the benefits unmistakable, turning it into a central reference for marketing choices and wider decision-making. Accordingly, brainstorming must be followed by rigorous critique to ensure relevance to the target audience, clarity and quick comprehension.

For the captation, after several iterations the most suitable sentence for THE DRS was: **"A digital system to streamline store operations and empower frontline performance."** These eleven words capture the essence and primary goal of THE DRS.

Regarding the paragraph, discussion with thesis advisors showed it risked diluting customer attention. The longer text edged towards brand strategy and weakened the core message. Consequently, this element was removed from the final value proposition, leaving the illustrative section.

The final section was labelled Advantages. Because images and video cannot be shown for confidentiality reasons, concise bullet points express the essence of THE DRS just as effectively. The points, derived from analysis of the feature list and observation of the app in use, are:

For confidential reasons this cannot appear in the dissertation.

5.2 Functional Classification of THE DRS (TPS, OSS, MIS)

For confidential reasons most of this subchapter was removed.

To reduce that complexity while preserving intent, features are grouped into three tiers that reflect how the platform operates in practice. Operational corresponds to TPS and contains point-of-work event capture, these systems are critical for businesses because they manage the recurring transactions required for business operations at an organisational level and keep the operational record current. Support corresponds to OSS and organises workflows, documents and communication so that raw events become controlled, auditable work. Management consolidates MIS, DSS and EIS into a single tier because these layers form a continuum that uses the same underlying records with differences of aggregation, time horizon and interactivity rather than kind.

6

METHODOLOGY

6.1 Research Strategy and Case Study Design

As previously mentioned, this empirical study examines how the DRS can be applied across new and different sectors. The design is a mixed methods case study where the qualitative groundwork, written earlier, stating the DRS's value proposition, defining the system's features with functional classification and arranging them by the three levels. Then, the practical strand introduces a framework composed of a brief questionnaire and an analytical model, applied in three cases to translate local needs into a form that can be assessed consistently.

The mixed methods strategy is appropriate because the thesis requires both meaning and measurement, where qualitative inputs surface context specific requirements and organises them across the operational, support and management lenses, and quantitative analysis then supplies clear evidence of patterns and effects. The sequence is straightforward, making a clear framework to apply to various sectors.

6.2 Assessment of Customer Needs

To obtain customers' requirements there are certainly many ways, such as semi-structured observational studies or focus groups, but for the present study the most suitable one is a questionnaire. Clarifying the scope of the construct in advance allows respondents' attention to be guided towards the precise aspects targeted by the selected items. This approach produces comparable and analysable data across sectors with strong reach and cost efficiency, providing exactly the input required for the subsequent scoring of applicability [73], [74] .

Ultimately, there are also some common pitfalls for example: non-response, literacy effects, ambiguous language, and agreeing tendency, and these are offset by the translations and analyses of the ratings chosen by participants. These measures preserve the advantages of the questionnaire while moderating the most frequent risks to data quality [73], [74].

6.2.1 Building a questionnaire with DIANA

To ensure the questionnaire is robust, a guiding framework is required to maintain a clear focus on the study objective and to provide methodological direction. The DIANA framework is therefore adopted as a problem-structuring approach, although not a questionnaire design guide per se, its flexibility allows it to be used to structure and inform the development of the questionnaire in this study. Before its application, the five DIANA steps are briefly outlined.

First is DEFINE, where Key Decision Makers (KDMs) state the problem in operational terms, confirm resource limits via the four Ms (manpower, minutes, money, motivation), and agree success measures. INCREASE then deliberately expands the search space with KDMs and stakeholders generate longlists of options and candidate criteria (often augmented by AI), capturing ideas and constraints without judgement to surface enablers. In ASSESS, longlists become decision architecture as compulsory filters are ranked as non-negotiables, optional filters are weighted to make trade-offs explicit, outputting a documented shortlist plus filter set is produced under KDM mandate. NARROW is where the VCW Funnel is used to ultimately cut and elicit the most suitable answers for said question. Finally, ACT operationalises the choice, where the four Ms are re-validated, ownership and milestones assigned, and monitoring embedded, with iteration back to earlier stages as results dictate.

The DIANA framework was adapted to the present problem through a close reading of its stages and an explicit clarification of the intended outcome. In the DEFINE phase, the conventional 4Ms diagnostic was judged to add limited value, as the project is conducted by a single researcher. Manpower is restricted to one person, time can be flexibly allocated during questionnaire design, no budget is involved, and motivation is anchored in answering the research questions rigorously. Drawing on the VCW literature, a practical approach was identified that structures DEFINE into three elements: the Challenge, which articulates the problem, the Key Insight, which captures salient information about that problem and the Key Decision Maker, which designates who will ultimately make or inform decisions.

Within this structure, the Challenge is to construct a simple and well-organised questionnaire capable of identifying and prioritising the digital needs of diverse industries in direct relation to the DRS system, while remaining sufficiently general to be applied across sectors. The accompanying Key Insights emphasise that the form should be quick to complete and easy to understand, yet broad enough to accommodate sectoral variation. The principal Key Decision Maker at this stage is the researcher. In subsequent application, respondents from each industry will also operate as decision makers by signalling and prioritising their digital needs through their responses.

Addressing this phase required early decisions about the questionnaire architecture and mode of administration. The instrument needed to function across sectors, align directly with the DRS, and avoid requiring different versions for every context under study. This prompted a choice between sending the questionnaire on its own or using it to support short, structured interviews for richer detail. Upon reflection, the interview-led approach was judged more

suitable. As a result, the questionnaire was organised into two parts: one focused on the DRS features and day-to-day work, and another focused-on sector-specific needs.

During the INCREASE phase, the task was to determine how to phrase the questions and what type of answers to collect. Retracing back to the scientific research, it was found that the House of Quality privileges a five-point prioritisation of the voice of the customer, which guided the design towards one to five ratings applicable across sectors. Criteria were also defined to score items and remove weaker ones in the NARROW phase, shaping the first part of the questionnaire. The second part needed to capture client specific needs and indicate where the DRS can help, so open ended prompts were introduced because simple ratings were not sufficient for that purpose. The initial set of thirty-five questions for the first section is presented below:

For confidential reasons the questions were removed.

Following the formulation of the questions, a set of filters was developed for subsequent application within the VCW Funnel. The objective was to reduce the number of items, simplifying the instrument while maintaining balanced attention to the DRS and day-to-day work practices. Five filters were defined to support this process:

- Alignment with the Challenge
- Technical/Operational Feasibility
- Stakeholder Value
- Functional Adherence to the DRS
- Non-Redundancy

For the open-ended component, bulk generation was unnecessary. The requirement was to frame prompts capable of eliciting the full range of problems encountered in day-to-day work. The resulting set is presented below:

- Is there any need, difficulty or idea that you've never been asked about, but that you think is important for improving your work?
- What day-to-day tasks do you think could be faster or simpler if they were done with digital support?
- Is there any part of internal communication or the organisation of teamwork that you think could be improved?
- Do you usually have easy access to information about the performance of your work area? Would you like to?

In the ASSESS phase, the questions were reviewed, and the candidate filters prioritised. The analysis ensured that every item was phrased to elicit a one-to-five response so during this review, two proposed filters were judged unsuitable at this stage. Stakeholder Value was

not informative in a context with a single project owner, and Technical or Operational Feasibility was intentionally deferred to preserve the authenticity of stakeholder input and assuming that the DRS's configurability allows many requirements to be satisfied through parameter settings rather than bespoke development, although universal coverage cannot be expected. Formal feasibility will be assessed after the questionnaire has been administered.

Three filters were therefore retained: Non-Redundancy, Alignment with the Challenge, and Functional Adherence to the DRS. The sequence moves from broad clarity to practical action. Non-Redundancy first removes overlaps and reduces cognitive load then Alignment with the Challenge then ensures that the remaining items address the aim of defining client and industry information-system needs while excluding peripheral topics, subsequently, Functional Adherence to the DRS is applied last to confirm a clean mapping to the DRS capabilities.

For the open-ended prompts, early elimination was avoided. These items are designed to support brief, structured interviews, and their value is best assessed in practice during field application.

In the NARROW phase the VCW FUNNEL was applied. Collecting the 35 questions and three ranked filter, Figure 6.1 shows how the VCW Funnel laid out the 20 best questions.

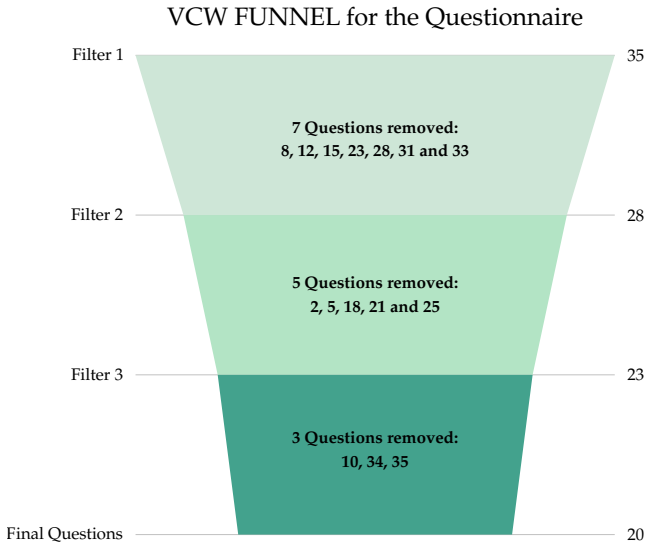

Figure 6.1 — VCW Funnel application

Here is the finalised list of the 20 questions:

For confidential reasons the final questions were removed.

The VCW Funnel refined a broad set of options into twenty focused questions that align with the DRS's capabilities and the practical needs of information systems across industries. By removing overlaps, retaining only items that addressed the research challenge, and confirming direct mappability to the DRS, the process produced a concise, sector-agnostic set

ready for application. These twenty questions provide a robust foundation for the next phase, enabling consistent data collection and a smooth transition to AHOQ analysis.

In the ACT phase, the questionnaire was constructed using Google Forms due to its usability and familiarity among respondents. A clear structure was established, beginning with an introductory page that includes brief contextual items. These cover sector identification as a short response, years of experience as a multiple-choice item, perceived reliance on paper or manual records, support from digital solutions and access to decision-making tools, all individually using a five-point scale. The core of the instrument is then organised around the three information-system layers already defined, with sections for operational, support, and management needs, complemented by a final section for sector-specific input. The twenty validated questions were allocated across these sections according to their functional focus, preserving alignment with the DRS's feature map while ensuring practical applicability in diverse settings.

For confidential reasons the organised questions were removed

6.2.2 Adding a Script to complete the questionnaire

As the questionnaire will be administered in real-world interviews, best practice is to develop a structured script and follow it. The script should begin with a brief statement of purpose, set out the interview procedure, and provide clear guidance on how respondents should answer the questions. The final script is presented below:

SCRIPT FOR THESIS MEETINGS

Hello, and thank you very much for taking the time to do this interview.

My name is Diogo Fonseca, I'm in the fifth year of my Integrated Master's Degree in Industrial Engineering and Management, and I'm currently developing my master's thesis. The aim of my research is to understand how different professional realities can benefit from digital solutions in their daily lives.

This interview is precisely to gather your perspective, based on your direct experience in the field. I'm not here to evaluate your work, but rather to better understand the needs of your context and the challenges you face.

I would also like to inform you that this conversation will be recorded, just so that I can review the answers more carefully later. The recording will be used exclusively for academic purposes, and your identity will not be revealed at any point in the final work.

The interview is divided into three parts:

1. Firstly, I'll ask you a few quick questions about your role and your professional experience, for a better context.

2. Next, I'll present a series of short questions, which I'll ask you to prioritise from 1 to 5, depending on how important these topics are in your day-to-day life.

3. Finally, I'll ask you some more open-ended questions, so that we can explore your routines, the tools you use and any difficulties in more detail.

Feel free to answer simply and informally - there are no right or wrong answers. Anything you share is useful for this research.

For confidential reasons most of the questionnaire was removed.

6.3 The Applicability Houses of Quality (AHOQ)

This subchapter sets out the approach used to answer RQ3: "How can you develop a methodology to score the applicability of the DRS to a business scenario?". The methodology is explained in detail later, but its execution relies on a model built with the House of Quality. The choice of the House of Quality is deliberate as its essence cross matches customer requirements with technical functionalities in a direct and auditable manner, turning elicited needs into explicit relationships that can be inspected and validated. The structure provides clear traceability from each requirement to the features that address it, which is essential for accountability and for revisiting decisions as further evidence emerges. The model supports comparability across sectors because the same mapping logic can be applied to different requirement sets without changing the underlying mechanics, which represents one of the primary intended characteristics. Also, it improves communication with decision makers by presenting a compact visual of coverage and gaps, while keeping the assumptions transparent. Finally, it bridges qualitative insights from interviews and questionnaires to quantitative evidence that guides feature road-mapping and investment choices, which is the core objective of RQ3.

6.3.1 AHOQ Model Structure

The three informational levels defined in RQ1.2: Operational, Support, and Management, provide the organising logic for both the needs assessment and the applicability model. This structure was first used to classify the DRS's functionalities conceptually, then carried into the questionnaire design in RQ2 to elicit requirements within the same domains and now underpins the analytical model in RQ3. To preserve alignment across stages and maintain traceability from elicited needs to technical evaluation, the AHOQ design comprises three distinct Houses of Quality where each House corresponds to one level and contains only the relevant DRS features for that layer. The Operational House assesses the TPS features, the Support House addresses the OSS features, and the Management House covers EIS – MIS – DSS features, concluding the pyramid previously presented. This separation reduces construct overlap, ensures that each feature is judged in its proper context, and enables clear aggregation within and across levels to derive the final applicability result.

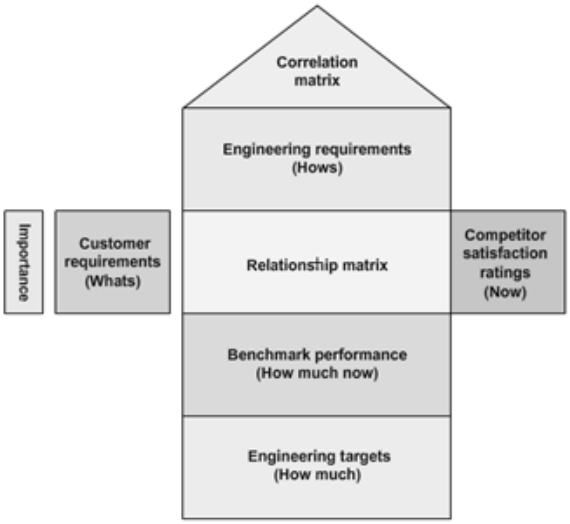

Figure 6.2 — House of Quality (Source: [75])

Figure 6.2 above depicts a standard House of Quality used in classical Quality Function Deployment, with customer requirements and their importance ratings linked to engineering characteristics through a relationship matrix, a correlation "roof" among engineering characteristics, competitor assessments and benchmarking columns, and target values for the engineering side. This full configuration is well suited to product design problems in which teams must balance trade-offs, set quantitative targets and compare alternative offerings.

For an applicability model that evaluates a fixed platform rather than designs a new one, several elements were removed by design. In particular, the importance band beside the customer requirements was removed, since all requirements are treated as priority items for coverage and any weighting is applied later during the calculation stage. The roof was omitted because correlations among the DRS features are largely stable and not a lever in this decision context, whereas the roof primarily supports engineering trade-offs during design. Competitor satisfaction ratings and benchmarking were excluded due to limited availability and comparability of cross-sector evidence and to avoid introducing unverifiable assumptions into what must remain a sector-neutral assessment. Target values and technical difficulty fields were removed, as AHOQ assesses whether capabilities fit, not how far they should be engineered towards numerical targets. These choices align with established descriptions of the House of Quality and with modern guidance that QFD artefacts should be tailored to the problem context rather than copied wholesale.

The result is a lean model for clear applicability scoring. It keeps the customer requirements that capture sector needs, the DRS features on the engineering side, and the relationship matrix that links them with defined strengths. The model is implemented in Microsoft Excel to support transparency and replication. Figure 6.3 presents the Operational House as the main example. The Support and Management Houses are provided in the appendix and are referenced where relevant in the thesis.

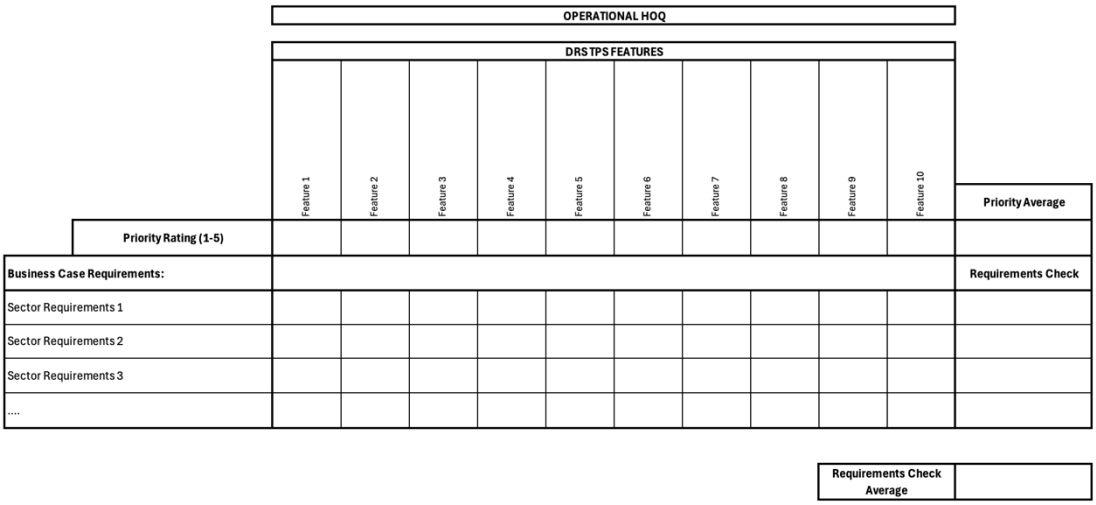

Figure 6.3 — AHOQ model (Operational HOQ)

In the adapted design the importance dimension is relocated from the Voice of the Customer to the DRS features since feature priorities are received through the questionnaire and are used later in the calculations to the Priority Average. This shift keeps the requirement side focused on coverage while allowing the customer to indicate which features matter most within the relevant level.

Two additions support interpretation and comparability. The Priority Average reports the mean of the feature-priority ratings, normalised to 100%, so if every feature were rated at the maximum (5 out of 5). It provides a succinct indicator of demand for that House's feature set and supports comparison across business cases. The Requirements Check Average reports the share of elicited requirements that are covered by at least one feature. It captures breadth of fit, highlights uncovered needs, and becomes a key component of the result calculations that follow.

6.3.2 Connection with the Questionnaire

Understanding how the connection works between the questionnaire and the model is crucial for the use of the AHOQ model. The interview, after the introductory questions, begins by asking respondents to rate the DRS features on a one-to-five scale. Those ratings flow directly into the priority row of the relevant House, where they express the sector's valuation of each feature and later inform the weighting of relationships.

Now the second part of the interview, the open-ended questions, consists of the most important and delicate phase. The respondent's statements must be translated into precise, stand-alone requirements that are then placed in the sector requirement rows and subsequently rated. Achieving a faithful translation depends on clear dialogue, careful clarification where needed, close listening to the recording, and firm understanding of both the DRS feature set and the sector under study. Every requirement is then put in the model independently if it's already known that the DRS can cover it. This disciplined handover preserves meaning while making the insights operational within the AHOQ structure.

6.3.3 Ratings and Result Calculations

Another purpose of this model is to be capable of delivering a defensible judgement of how applicable the DRS is to any given sector. The pathway to that result begins by assigning relationship strengths between sector requirements and DRS features.

The standard 0–3–9 scale from House of Quality practice is adopted, meaning that a score of 0 indicates that a feature does not address the requirement while a score of 3 indicates partial coverage, either because the feature falls short on its own or because coverage would rely on combining multiple features. Moreover, when a pairing receives a 3, it also signals a design opportunity as the requirement may be satisfied through a composite solution that blends the features rated at 3, or through the creation of a new feature that consolidates their capabilities in a single, fit for purpose design. At last, a score of 9 indicates full coverage, including cases where sector-specific adjustments are needed. Once a pairing attains a 9, the remaining feature cells for that requirement are closed, since further evaluation is unnecessary when the requirement is already satisfied. In the spreadsheet these closed cells are shaded, as shown later in the business case examples. All ratings are recorded in the relationship matrix, which then feeds the subsequent calculations.

The Requirement Check column records a binary outcome for each requirement. A value of 1 is entered when the requirement is satisfied, evidenced by a 9 in its row and 0 otherwise where only 3s or 0s appear. The Requirement Check Average then reports the normalised proportion of satisfied requirements, providing a clear summary measure for interpretation.

This rating scheme makes the model more than a measure of sector applicability since it also serves as a guide to future development by indicating where the DRS should evolve to extend its relevance across additional sectors, which was among the principal attributes targeted.

The final result is obtained by translating coverage into a single applicability score. The purpose of AHOQ is to assess how well the DRS fits a new sector. Since the DRS's value proposition centres on empowering frontline performance, the core signal must be the extent to which the elicited requirements are satisfied within each informational level.

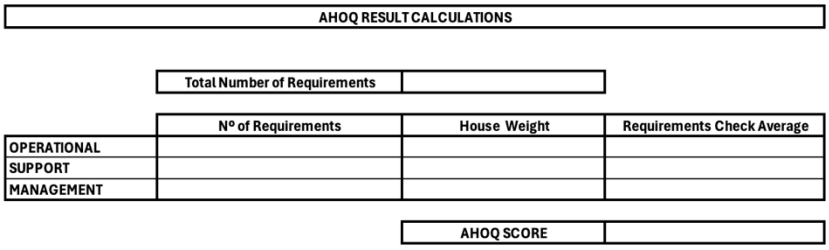

Figure 6.4 — AHOQ Result Calculations section

As shown in Figure 6.4, the worksheet first records the Total Number of Requirements identified in the interview. The summary table beneath is organised by House, with one row for Operational, Support and Management. The first column, Nº. of Requirements, counts how many requirements were allocated to that specific House. The second column, Weight of Each

House ($\omega_{HOQ.i}$) expresses that count as a proportion of the total. The third column, Requirement Check Average ($RCA_{HOQ.i}$), reports the share of those requirements that are satisfied by DRS features. The AHOQ Score is then obtained by summing the products of each House weight and its Requirement Check Average, producing a single applicability score. Below is exemplified the mathematical equation for the AHOQ value where i stands for O – Operational, S – Support and M – Management.

$$AHOQ\ SCORE\ = \sum_{i=O,S,M} \omega_{HOQ.i} \times RCA_{HOQ.i}$$

Before closing the model, a final step is undertaken and that is the feature ranking. Once the matrices are complete, the performance of each feature in the specific business case is reviewed. A summary table records, for every feature, its position in the ranking, its name, the House to which it belongs, the priority rating obtained from the questionnaire, and the 9-Match which means the count of full matches, that is, the number of times the feature achieved a score of nine against a requirement. The final column assigns a tier based on this evidence.

The tiering scheme groups features into three bands. Tier 1 contains features that fully cover at least one requirement, evidenced by one or more nines, Tier 2 contains features that record no nines but were assigned the maximum priority rating of five by respondents and Tier 3 contains the remaining features, ordered by their priority rating.

Table 6.1 — Blank Feature Ranking Table

FEATURES RANKING					
RANK	FEATURE NAME	HOUSE	PRIORITY RATING	9-MATCH	TIER
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
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20					

6.3.4 AHOQ Dashboard

For a better universal understanding of the model a concise dashboard sorts a summary that is easy to read and act upon. It highlights the main conclusions and presents the evidence in a way that decision makers can interpret quickly. It is intended for use in meetings with the development team and senior stakeholders, where clear communication and traceability are essential.

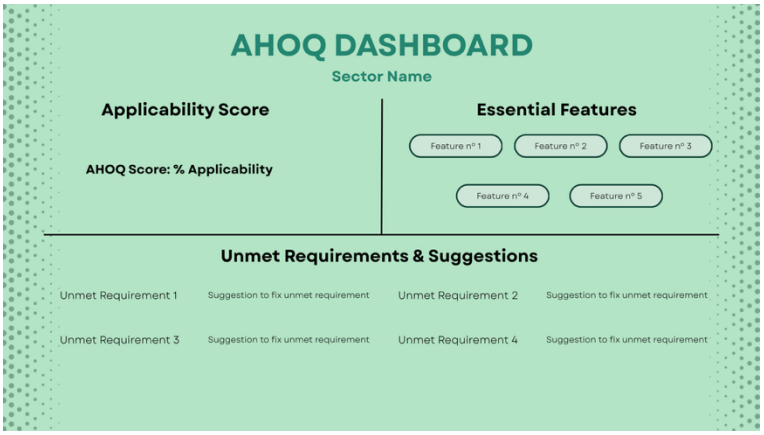

Figure 6.5 — AHOQ Dashboard Template

The dashboard, Figure 6.5, contains three components. The panel on the top left reports the applicability score for the business case, expressing the weighted coverage of requirements across the three Houses. The panel on the top right presents the top five features most likely to help the sector, typically drawn from Tier 1 in the feature ranking. The lower panel lists the unmet requirements and pairs each with a short recommendation drawn from analysis of the matrices and the interview record.

6.4 ASYS (Applicability System)

The Applicability System, referred to as ASYS, is organised in three phases and guides the user through a step-by-step pathway.

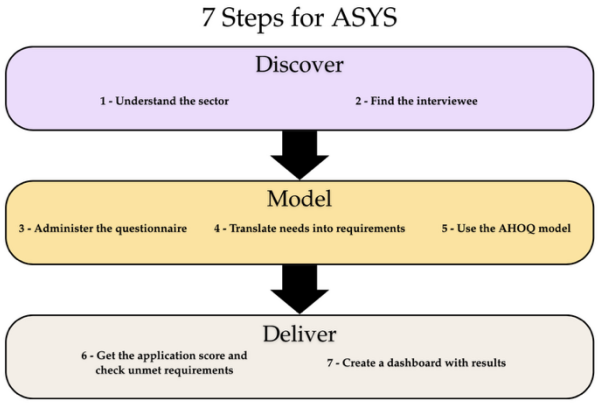

Figure 6.6 — ASYS Framework

The ASYS framework, illustrated in Figure 6.6, was developed after completing two business cases that will be shown afterwards. It was designed to facilitate and streamline the combined use of the questionnaire and the AHOQ model, ensuring uniformity across all subsequent case studies. The framework is structured around three major phases: Discover, Model and Deliver, which together form a structured path from sector exploration to actionable results.

The Discover phase sets the foundation. The first step is to examine the sector in order to understand its context and specific operational environment, then in step number two the appropriate interviewee is identified, ensuring that the insights collected are both relevant and representative.

The Model phase formalises the information gathered. In step three, the questionnaire is administered to obtain structured input. Step four, the most critical stage, translates interviewees' needs into structured requirements, thereby facilitating effective use of the model. Closing the Model phase, step five, runs the requirements through the AHOQ model to evaluate, systematically, how the platform's features align with sector needs.

The Deliver phase generates actionable outputs. The applicability score is calculated, highlighting both coverage, unmet requirements and the most appropriate recommendations for those unmet requirements are proposed. Finally, the dashboard is created to present the results in a concise and accessible form, supporting decision-making and stakeholder alignment.

Together, these three phases create a consistent and transparent process that moves from sector-specific insights to comparable, data-driven evaluations across business cases.

7

CASE STUDIES, RESULTS AND ANALYSIS

7.1 Sector Selection

For confidential reasons this subchapter is removed.

7.2 Case Study 1 – TV Production

7.2.1 Discover phase

7.2.1.1 Step 1: Understand the sector

The first case study performed was to TV production. The reason for its selection was because day to day work depends on rapid coordination across multiple roles and frequent handovers, which often leads to fragmented information flows and improvised communication practices. These conditions align with the DRS's core value proposition of paperless execution, robust traceability and centralised operational communication, making TV production an appropriate context in which to test applicability.

7.2.1.2 Step 2: Find the Interviewee

Selection was informed by previous contact with this professional environment. Prior engagement with practitioners had revealed recurrent issues, including dispersed information, limited visibility of plans and uncertainty over whether shift reports were read and acted upon. This proximity secured access to an informed participant and kept the assessment focused on tangible operational frictions rather than abstract assumptions.

7.2.2 Model phase

7.2.2.1 Step 3: Administer the questionnaire

Data were collected through a single face to face, guided interview with a frontline professional, conducted in Portuguese on 27th July 2025. The meeting lasted no more than twenty minutes where the opening five minutes were used to clarify the context and scope of the

study, after which approximately fifteen minutes were dedicated to administering the questionnaire. The figures and tables presented subsequently are screenshots exported from the Excel consolidation of responses, while the underlying answers were collected through Google Forms.

Table 7.1 — Identification Table from TV Production Case Study

IDENTIFICATION

Questions	Answers
Sector Identification	TV Production
Years of experience in the sector	Less than a year
Does your daily work involve a lot of paper or manual records?	2
Do you feel that your work is well supported by digital solutions? Or do you often feel 'alone' in the process?	3
Do you feel you have access to the right tools to make decisions in your day-to-day life?	4

The interviewee identified the sector as TV production, with less than one year of experience. Paper or manual records were rated "2", indicating limited yet present reliance. Perceived digital support for the job was rated "3", and access to decision making tools scored "4", signalling reasonable but improvable support.

7.2.2.2 Step 4 – Translate needs into requirements

As the audio file cannot be embedded, the following material presents translated notes drawn from short extracts of the interview's open-ended questions. The notes were captured rapidly during playback, are intentionally brief and direct. The notes from the TV Production meeting are transcribed below:

Question 1: Is there any need, difficulty or idea that you've never been asked about, but that you think is important for improving your work?

Notes from Answer 1: Team communication reports were made but not seen. Their way of sharing plans sometime was to use paper and stick it on the wall and whoever saw it saw it. Need better planning. They would write in the shift report something that was needed the next day and if they didn't see it, it would not be resolved. Have the information centralised in an easily accessible place, not have a conversation on a lost group chat, an email somewhere, etc.

Question 2: What day-to-day tasks do you think could be faster or simpler if they were done with digital support?

Notes from Answer 2: Planning simpler tasks that are coordinating through all teams. Create easier way to speak to each other. Create simple task planning. Hard for everybody to be on the same page.

Question 3: Is there any part of internal communication or teamwork organisation that you think could be improved?

Notes from Answer 3: Already answered in previous questions

Question 4: Do you usually have easy access to information about the performance of your work area? Would you like to have it?

Notes from Answer 4: There is no communication about performance. Bosses do not give as much feedback as necessary. There should be more help in teaching how to do things. There was a lot of improvisation. "We have to make x and y happen now, someway, somehow" this was a repetitive situation, there is a production book that has the procedure for some situations, but at those moments you are not going to look for that book.

To achieve better answering, follow-up questions were used, also to elicit concrete examples and to determine whether the issues were isolated or routine, and the responses indicated recurring friction. The notes converge on fragmented information, missed or unseen notices, scattered communication across group chats and email, and planning that was neither visible nor shared, which allowed tasks to lapse between shifts. The evidence points to the need for a central workspace for plans and instructions, lightweight coordination and task planning to align teams, and accessible performance views with timely feedback to reduce improvisation.

Translating raw interview material into discrete requirements is a critical step for validity and for preserving traceability between evidence and the AHOQ assessment. The process followed the previously explained 3 levels of IS lens, in three passes. A first pass with a TPS focus identified "Have a task plan that is visible and accessible to everyone, in digital form" and "Avoid using paper stuck on the wall as a method of operational communication."

A second pass sought OSS needs and surfaced: "Ensure that shift reports are read and followed up on the next day," "Have a centralised location where all information is accessible to the team," "Have a centralised and simple way to communicate between colleagues and teams," and "Share and coordinate planning in a clear and visible way." The same pass also captured "Have more support and practical training on how to perform tasks" and "Replace the production 'book' with something more practical and accessible at the time of execution."

A final pass for MIS/DSS/EIS identified these two requirements: "Have access to the performance of the work done" and "Receive more regular feedback from managers."

Taken together, these statements retain the intent of the interview while expressing needs in requirement form. The phrasing remains close to the source to protect meaning.

7.2.2.3 Step 5: Use the AHOQ Model

	OPERATIONAL HOQ										
	DRS TPS FEATURES										
	Feature 1	Feature 2	Feature 3	Feature 4	Feature 5	Feature 6	Feature 7	Feature 8	Feature 9	Feature 10	Priority Average
Priority Rating (1-5)	5	4	4	3	5	4	4	3	4	5	82,00%
Business Case Requirements:											**Requirements Check**
Have a task plan that is visible and accessible to everyone, in digital form										9	1
Avoid using paper stuck on the wall as a method of operational communication	9										1
									Requirements Check Average		100,00%

Figure 7.1 — Operational HOQ from TV Production Case Study

Figure 7.1 presents the operational house and its ratings. "Have a task plan that is visible and accessible to everyone, in digital form" was rated as a 9-match to Feature 10 since this reflects the feature's native purpose of creating the daily plan and assigning tasks to roles and shifts. "Avoid using paper stuck on the wall as a method of operational communication" was rated as a 9-match to Feature 1, which provides digital records and notices that replace paper artefacts and allow updates to persist into the following shift.

With these decisions both TPS requirements are met, producing a Requirements Check Average of 100%. The Priority Average of 82% reflects the interview weights across TPS features, with high salience for Feature 10 and Feature 1 and lower salience for peripheral capabilities that were not required to satisfy the two operational needs.

	SUPPORT HOQ					
	DRS OSS FEATURES					
	Feature 11	Feature 12	Feature 13	Feature 14	Feature 15	Priority Average
Priority Rating (1-5)	5	4	5	4	5	92,00%
Business Case Requirements:						**Requirements Check**
Ensure that shift reports are read and followed up on the next day				9		1
Have a centralised location where all information is accessible to the team					9	1
Have a centralised and simple way to communicate between colleagues and teams	9					1
Share and coordinate planning in a clear and visible way	3	0	0	3	3	0
Have more support and practical training on how to perform tasks					9	1
Replace the production 'book' with something more practical and accessible at the time of execution					9	1
				Requirements Check Average		83,33%

Figure 7.2 — Support HOQ from TV Production Case Study

Figure 7.2, presents the Support house. From the requirements, "Ensure that shift reports are read and followed up the next day" aligns with Feature 14, since alerts and acknowledgements sustain continuity between shifts. "Have a centralised location where all information is

accessible to the team", "Have more support and practical training on how to perform tasks" and "Replace the production 'book' with something more practical and accessible at the time of execution" map to Feature 15, which provides a single point of reference for SOPs, files and job aids. "Have a centralised and simple way to communicate between colleagues and teams" maps to Feature 11, reflecting the need for routine in-platform exchanges.

"Share and coordinate planning in a clear and visible way" receives 3 relationships to Feature 11, Feature 14 and Feature 15 because these features enable dissemination, messaging and storage, yet they do not establish or maintain a live plan, which is treated as a TPS concern through Feature 10.

With five rows achieving at least one 9-match, the Requirements Check average is 83.33%. The Priority Average of 92% reflects the high interview weighting placed on communication, information access and operational support capabilities.

MANAGEMENT HOQ						
	DRS EIS - DSS - MIS FEATURES					
	Feature 16	Feature 17	Feature 18	Feature 19	Feature 20	Priority Average
Priority Rating (1-5)	4	3	4	4	4	76,00%
Business Case Requirements:						**Requirements Check**
Have access to the performance of the work done		9				1
Receive more regular feedback from managers	3	0	0	3	0	0
				Requirements Check Average		50,00%

Figure 7.3 — Management HOQ from TV Production Case Study

Figure 7.3 presents the Management house. From the requirements, "Have access to the performance of the work done" was scored as a 9-match to Feature 17. This feature already consolidates outcome indicators that allow managers and staff to review results at the level required for the case, which justified a direct match. "Receive more regular feedback from managers" did not attain a 9-match, it received 3-relationships to Feature 16 and to Feature 19, indicating that task status and historical traces can inform conversations but do not, on their own, provide a structured feedback mechanism.

With only one of the two rows achieving at least one 9, the Requirements Check average is 50%, the Priority Average of 76% signals meaningful, though not dominant, emphasis on these managerial capabilities in the interview.

7.2.3 Deliver phase

7.2.3.1 Step 6: Application Score and Unmet Requirements

Table 7.2 — Results Table from TV Production Case Study

AHOQ RESULT CALCULATIONS			
	Total Number of Requirements	10	
	Nº of Requirements	House Weight	Requirements Check Average
OPERATIONAL	2	0,2	100,00%
SUPPORT	6	0,6	83,33%
MANAGEMENT	2	0,2	50,00%
		AHOQ VALUE	80,00%

Table 7.2 presents the results of the AHOQ calculation. The House Weights were set to mirror the distribution of requirements across the information levels, with Operational at 0.2, Support at 0.6 and Management at 0.2. The Requirement Check averages reached 100% in Operational, 83.33% in Support and 50% in Management. Applying these weights yields an overall applicability score of 80%, signalling a strong fit while highlighting a residual gap in regular, structured managerial feedback. This is a very optimal score for the DRS.

Table 7.3 — Feature Ranking Table from TV Production Case Study

FEATURES RANKING					
RANK	FEATURE NAME	HOUSE	PRIORITY RATING	9-MATCH	TIER
1	**Feature 15**	Support	5	3	1
2	**Feature 10**	Operational	5	1	1
3	**Feature 11**	Support	5	1	1
4	**Feature 1**	Operational	5	1	1
5	**Feature 14**	Support	4	1	1
6	**Feature 17**	Management	3	1	1
7	**Feature 13**	Support	5	0	2
8	**Feature 5**	Operational	5	0	2
9	**Feature 12**	Operational	4	0	3
10	**Feature 18**	Support	4	0	3
11	**Feature 19**	Management	4	0	3
12	**Feature 20**	Management	4	0	3
13	**Feature 9**	Management	4	0	3
14	**Feature 16**	Operational	4	0	3
15	**Feature 2**	Management	4	0	3
16	**Feature 7**	Operational	4	0	3
17	**Feature 6**	Operational	4	0	3
18	**Feature 3**	Operational	4	0	3
19	**Feature 4**	Operational	3	0	3
20	**Feature 8**	Operational	3	0	3

Table 7.3 reports the feature ranking derived from the three houses. These scores combine the interview priorities with the presence of 9 relationships. Tier 1 comprises Feature 15, Feature 10, Feature 11, Feature 1, Feature 14 and Feature 17, reflecting emphasis on centralised knowledge, visible planning, in platform communication and outcome visibility. Feature 13 and Feature 5 form Tier 2, with the remainder in Tier 3. The profile shows OSS capabilities at the top, anchored by Feature 10 on the operational side.

7.2.3.2 Step 7: Dashboard with Results

For confidential reasons the dashboard and suggestions for unmet requirements is removed.

7.3 Case Study 2 – Nursing Sector

7.3.1 Discover phase

7.3.1.1 Step 1: Understand the sector

In the second case study, attention shifts to the Nursing Sector. The reason behind choosing this sector comes from discussions with The company that highlighted the health sector as a promising domain for assessing the DRS outside retail. This choice aligns with the study's objective to test the DRS in contrasting operational retail environments as nursing work involves tightly coordinated, time-sensitive tasks, extensive documentation and strict compliance, making it a rigorous setting to examine paperless execution, traceability and centralised communication.

7.3.1.2 Step 2: Find the Interviewee

Access to informed participants was a practical constraint, and the only available contacts were practising nurses in frontline roles. Their proximity to point-of-care processes and compliance routines afforded a credible entry into the healthcare setting and a defensible proxy for broader sector dynamics within the limits of the study.

7.3.2 Model phase

7.3.2.1 Step 3: Administer the questionnaire

The interview occurred on the 4th of August 2025, via telephone as meeting in person was not feasible. The session followed the same approach as the first case study and lasted no more than twenty minutes.

Table 7.4 — Identification Table from the Nursing Case Study

IDENTIFICATION	
Questions	Answers
Sector Identification	Nursing
Years of experience in the sector	Less than a year
Does your daily work involve a lot of paper or manual records?	1
Do you feel that your work is well supported by digital solutions? Or do you often feel 'alone' in the process?	3
Do you feel you have access to the right tools to make decisions in your day-to-day life?	3

Starting with the Identification, the interviewee reported less than a year of experience, paper or manual records were rated “1”, signalling minimal reliance on paper and digital support was rated “3”, as was access to tools for day-to-day decision making, indicating a moderate level of support with scope for improvement.

7.3.2.2 Step 4 – Translate needs into requirements

The notes from the meeting follow the same format as in the first case are a presented below:

Question 1: Is there any need, difficulty or idea that you've never been asked about, but that you think is important for improving your work?

Notes from Answer 1: One of the biggest problems in the service is communication between doctors and nurses. A system that also facilitates the updating of therapeutic plans, action plans and tasks. Validation, medication and materials, it would be good to know what we have.

Question 2: What day-to-day tasks do you think could be faster or simpler if they were done with digital support?

Notes from Answer 2: The work usually involves a lot of human contact and then sitting at the computer to make the records. Example: how to request transport for patients. It would be good if the procedures and contacts were already explained on the computer.

Question 3: Is there any part of internal communication or teamwork organisation that you think could be improved?

Notes from Answer 3: Communication between doctors and nurses. Understanding what medicines, we have so that we don't prescribe something we don't have. Whether we need to order medication earlier.

Question 4: Do you usually have easy access to information about the performance of your work area? Would you like to have it?

Notes from Answer 4: No. Evaluation is done annually. It is limited.

To obtain replies that better reflected the context, follow up questions were also used, as in the first case. The statements point to persistent coordination gaps between doctors and nurses and to a need to update therapeutic and action plans in real time. Records are often completed after patient contact, which delays entry and risks omissions.

An example shared by interviewee shows routine processes such as arranging patient transport, lack clear on-screen procedures and contacts. Additionally, uncertainty about available medicines and materials risks prescribing items that are not in stock and prompts reactive ordering. Access to performance information is limited and annual evaluation restricts timely feedback. Overall, the picture supports requirements for integrated communication, point of

care documentation, clear protocols and stock visibility, together with more frequent performance review.

Following the structure used in the first case, the notes were translated into requirements through the three lenses of the Information Systems model. Beginning with the operational lens aligned with TPS, repeated references to keeping clinical instructions current during the shift and clarifying action plans indicate a need to prevent ambiguity at the point of care, therefore, this is best framed as the requirement "Update treatment plans and tasks in real time". Uncertainty about the availability of medicines and materials, which introduces delays and risks during care delivery, is captured by "Display available stock of medication and materials in the department". To avoid prescribing or attempting to administer items that are not available, the translation becomes "Alert if a medication is unavailable at the time of administration". Finally, the pattern of documenting only after patient contact is over, suggests avoidable waste and omissions is best described as the requirement, "Enable mobile or bedside records to reduce subsequent writing time".

From an OSS perspective, the recurrent friction in coordination between doctors and nurses calls for a single, reliable channel for exchanges during the shift, the most appropriate requirement is "Provide a communication channel between doctors and nurses". Delays when arranging routine services, such as patient transport, stem from the absence of on-screen procedures and contact details, the clearest formulation is "Quickly access protocols and contacts for recurring tasks".

Under the MIS–DSS–EIS lens, annual appraisal alone leaves little room for timely learning or course correction, the best way to express this as a requirement is "Include a feedback and performance evaluation module with regular inputs". These formulations preserve the intent of the interview material while converting it into discrete, traceable requirements that can be scored consistently within the AHOQ framework.

7.3.2.3 Step 5: Use the AHOQ Model

	OPERATIONAL HOQ										
	DRS TPS FEATURES										
	Feature 1	Feature 2	Feature 3	Feature 4	Feature 5	Feature 6	Feature 7	Feature 8	Feature 9	Feature 10	Priority Average
Priority Rating (1-5)	1	5	1	5	5	3	2	3	3	4	64,00%
Business Case Requirements:											Requirements Check
Update treatment plans and tasks in real time	3	0	0	0	0	0	0	0	0	3	0
Display available stock of medication and materials in the department		9									1
Alert if a medication is unavailable at the time of administration		9									1
Enable mobile or bedside records, reducing subsequent writing time	3	0	0	0	0	0	0	0	0	0	0
										Requirements Check Average	50,00%

Figure 7.4 — Operational HOQ from Nursing Case Study

Presented above, the Operational HOQ for Nursing shows two requirements achieve a 9 match via Feature 2, namely visibility of stocks and an alert when a medicine is unavailable

at the moment of administration fixing both requirements “Display available stock of medication and materials in the department “and “Alert if a medication is unavailable at the time of administration”. “Update treatment plans and tasks in real time” receives only a 3 link to Feature 10, as the feature would require substantial adaptation for healthcare use, possibly needing a big change and thorough customisation. “Enable mobile or bedside records” remains a TPS requirement that is not directly covered by the assessed TPS features.

On this basis the Requirements Check average stands at 50% and the Priority Average at 64%. The pattern indicates a partial operational fit, strongest where processes resemble stock and task coordination, and weaker where point of care clinical documentation is required.

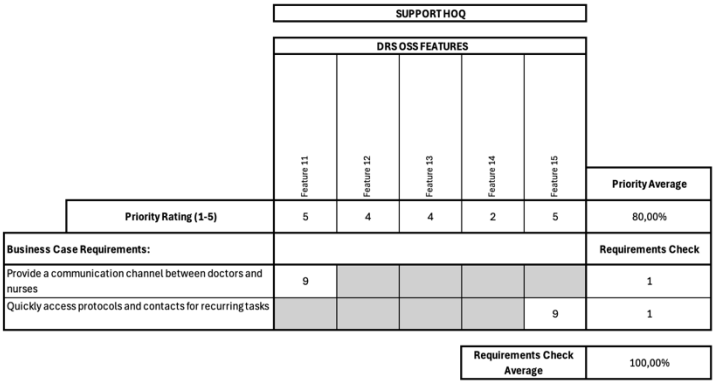

Figure 7.5 — Support HOQ from the Nursing Sector Case Study

The Support HOQ for Nursing, shown in Figure 7.5, obtains two requirements with 9-matches. The requirement to provide a communication channel between doctors and nurses attains a 9 match through the Feature 11, which directly supports day to day exchanges and clarifications. The requirement to quickly access protocols and contacts for recurring tasks achieves a 9 match through Feature 15. Feature 12 and Feature 13 were treated as enablers rather than direct satisfiers. This gives the Support HOQ a Requirements Check Average of 100%. The Priority Average of 80% reflects strong emphasis on coordination and ready access to operational knowledge, indicating a robust support level fit for this case.

MANAGEMENT HOQ						
	DRS EIS - DSS - MIS FEATURES					
	Feature 16	Feature 17	Feature 18	Feature 19	Feature 20	Priority Average
Priority Rating (1-5)	1	2	4	4	4	60,00%
Business Case Requirements:						**Requirements Check**
Include a feedback and performance evaluation module with regular inputs	0	0	0	0	0	0
				Requirements Check Average		0,00%

Figure 7.6 — Management HOQ from the Nursing Case Study

For the Management HOQ, Figure 7.6, the requirement to include a feedback and performance evaluation module with regular inputs does not map to any of the available MIS, DSS or EIS features, so the matrix records no 9 relationships, and the Requirements Check is zero. The Priority Average stands at 60%, which indicates meaningful importance despite the absence of coverage. The result points to a clear managerial gap that would need a lightweight feedback process to complete the cycle from planning and execution to review.

7.3.3 Deliver phase

7.3.3.1 Step 6: Application Score and Unmet Requirements

Once the feature-by-requirement cross matches had been rated, the AHOQ results were computed.

Table 7.5 — Results Table from the Nursing Case Study

AHOQ RESULT CALCULATIONS			
	Total Number of Requirements	7	
	Nº of Requirements	**House Weight**	**Requirements Check Average**
OPERATIONAL	4	0,57	50,00%
SUPPORT	2	0,29	100,00%
MANAGEMENT	1	0,14	0,00%
		AHOQ VALUE	57,14%

Table 7.5, records the AHOQ calculation from the case in study. House weights show Operational at 0.57, Support at 0.29 and Management at 0.14. Requirement Check averages meet 50% at Operational, 100% at Support and 0% at Management. The weighted result generates a AHOQ applicability measure of 57.14%. From the results, the overall AHOQ Value is lower than in the previous case. However, this does not imply that the DRS lacks relevance in the nursing sector as the Support house achieved 100 per cent, and the two unmet requirements can be addressed through targeted enhancements explained afterwards.

Table 7.6 — Feature Ranking Table from the Nursing Sector

FEATURES RANKING					
RANK	FEATURE NAME	HOUSE	PRIORITY RATING	9-MATCH	TIER
1	**Feature 2**	Operational	5	2	1
2	**Feature 11**	Support	5	1	1
3	**Feature 15**	Support	5	1	1
4	**Feature 4**	Operational	5	0	2
5	**Feature 5**	Operational	5	0	2
6	**Feature 10**	Operational	4	0	3
7	**Feature 12**	Support	4	0	3
8	**Feature 13**	Support	4	0	3
9	**Feature 18**	Management	4	0	3
10	**Feature 19**	Management	4	0	3
11	**Feature 20**	Management	4	0	3
12	**Feature 6**	Operational	3	0	3
13	**Feature 8**	Operational	3	0	3
14	**Feature 9**	Operational	3	0	3
15	**Feature 7**	Operational	2	0	3
16	**Feature 14**	Support	2	0	3
17	**Feature 17**	Management	2	0	3
18	**Feature 1**	Operational	1	0	3
19	**Feature 3**	Operational	1	0	3
20	**Feature 16**	Management	1	0	3

The feature ranking table, Table 7.6, shows that Feature 2 leads with two 9 matches. Feature 11 and Feature 15 follow, each with a single 9 match that captures the need for a doctor–nurse channel and rapid access to protocols and contacts. Feature 4 and Feature 5 sit in the second tier based on high stated priority but without a direct 9 match in this case.

7.3.3.2 Step 7: Dashboard with Results

For confidential reasons the dashboard and suggestions for unmet requirements is removed.

7.4 Case Study 3 – Construction Retail

7.4.1 Discover phase

7.4.1.1 Step 1: Understand the sector

This case study was the last meeting in the series and was selected to extend the evaluation of the DRS into a distinct retail setting. Construction retail presents a demanding context with a very large assortment, bulky items, long and variable lead times, and a high dependence on multiple suppliers. These characteristics create sustained pressure on inventory accuracy, purchasing discipline and supplier coordination, which in turn makes the sector a strong test for paperless execution, end to end traceability and centralised communication.

7.4.1.2 Step 2: Find the Interviewee

The interviewee was a pre-existing professional contact at a construction-focused retailer, with direct responsibility for stock and purchasing, who provided concrete pain points that will be accessed throughout the case.

7.4.2 Model phase

7.4.2.1 Step 3: Administer the questionnaire

Evidence for this case was gathered through a remote interview conducted on 10 September 2025 via Zoom. The conversation took place in Portuguese and the excerpts presented in this chapter are translated into English for reporting consistency. The session did not exceed twenty minutes, matching the time window used in the other two cases and notes were captured during the call and structured immediately afterwards to preserve accuracy.

Table 7.7 — Identification Table from the Construction Retail Case Study

IDENTIFICATION	
Questions	Answers
Sector Identification	Construction Retail
Years of experience in the sector	More than 10 years
Does your daily work involve a lot of paper or manual records?	4
Do you feel that your work is well supported by digital solutions? Or do you often feel 'alone' in the process?	3
Do you feel you have access to the right tools to make decisions in your day-to-day life?	3

The interviewee works in construction retail and has more than ten years of experience, which is markedly higher than in the other two case studies. The identification block records a paper reliance rating of four on the five-point scale, indicating substantial use of manual records, while perceived digital support and access to decision tools were both scored at three, suggesting adequate yet improvable provision.

7.4.2.2 Step 4 – Translate needs into requirements

The detailed feature ratings that informed these views are presented within the respective HOQ sections later in the chapter. Here are the notes from the meeting:

Question 1: Is there any need, difficulty or idea that you've never been asked about, but that you think is important for improving your work?

Notes from Answer 1: Stock management is deficient at the information level. For inventories, manual counts are done for 16,000 items. Stock management at the reorder-point level is needed.

Question 2: What day-to-day tasks do you think could be faster or simpler if they were done with digital support?

Notes from Answer 2: Placing an order takes a long time and is very labour intensive. Many suppliers. Too much paper. Purchasing is not very automated.

Question 3: Is there any part of internal communication or teamwork organisation that you think could be improved?

Notes from Answer 3: There are two communication channels, email and Teams. Teams is better because information flows more smoothly. Organisation is poor.

Question 4: Do you usually have easy access to information about the performance of your work area? Would you like to have it?

Notes from Answer 4: Access exists. Information should be more synthesised and more focused on what is needed.

As the other cases, the open responses point to recurrent problems that were clarified through brief follow-up prompts to ensure contextual accuracy.

Subsequently the translation followed a three-lens process. The first pass therefore targeted operational needs. The remark that stock information is weak, that inventories are manual for roughly sixteen thousand items and that tighter control at the reorder point is needed led directly to the TPS requirements "Real time stock visibility by item and location", "Digital inventory counting", and "Full traceability of counts, adjustments and orders with user and timestamp", respectively. The account of a slow, paper-based purchasing routine across many suppliers justified the requirement: "Fast purchase orders from low stock lists and sales history" to streamline buying activity, while the mention of discrepancies at receipt motivated "Paperless goods receiving with discrepancy capture and instant stock update".

The second pass addressed coordination and operational knowledge for the support. Many suppliers and scattered documents implied fragmented reference material, which translated into "Central repository for supplier documents, catalogues and contracts with quick search". Two parallel channels with poor organisation indicated the need to anchor collaboration around operational objects, which became "Team communication space linked to items, orders and tasks to cut email volume and improve organisation". The frequency of delays and the desire to route attention to Teams underpinned "Actionable notifications for low stock, reorder due and late deliveries".

The final pass covered oversight and feedback. Access to performance data already exists but the interviewee asked for information that is more synthesised and focused on what is needed. That request informed "Demand forecasting by category and supplier to plan peaks and seasonality", which concentrates managerial attention on planning and expected flow. "Purchasing performance metrics such as order cycle time and on time delivery", condenses operational performance into decision ready indicators and helps calculating more precisely the reorder point and other important metrics.

Each quoted requirement is placed as a row within its house and tagged to its originating note block, which preserves traceability for AHOQ scoring and enables a clear audit from interview evidence to matrix relationships.

7.4.2.3 Step 5: Use the AHOQ Model

	OPERATIONAL HOQ										
	DRS TPS FEATURES										
	Feature 1	Feature 2	Feature 3	Feature 4	Feature 5	Feature 6	Feature 7	Feature 8	Feature 9	Feature 10	Priority Average
Priority Rating (1-5)	5	5	3	4	5	2	4	5	4	4	82,00%
Business Case Requirements:											**Requirements Check**
Real time stock visibility by item and location.		9									1
Fast purchase orders from low stock lists and sales history.	3	3	3	0	0	0	0	0	3	0	0
Paperless goods receiving with discrepancy capture and instant stock update	9										1
Automatic label printing on delivery and when stock changes.								9			1
Digital inventory counting.		9									1
Full traceability of counts, adjustments and orders with user and timestamp.			9								1
										Requirements Check Average	83,33%

Figure 7.7 — Operational HOQ from the Construction Retail Case Study

The Operational HOQ, Figure 7.7, indicates strong direct coverage of core execution needs. “Real time stock visibility by item and location” attains a 9 against Feature 2. “Fast purchase orders from low stock lists and sales history” records enabling 3s on Feature 1, Feature 2, and Feature 9. Digital workflows and stock insight shorten the ordering path and support ERP handoff, yet the absence of a dedicated ordering module prevents a direct 9, which is why the requirement is marked as unmet in the check. The third requirement: “Paperless goods receiving with discrepancy capture and instant stock update” earns a 9 for Feature 1. “Automatic label printing on delivery and when stock changes” aligns one to one with Feature 8 and therefore receives a 9. “Digital inventory counting” secures a 9 with Feature 2. “Full traceability of counts, adjustments and orders with user and timestamp” maps to Feature 3 with a 9.

The Requirements Check average stands at 83.33%, with five of six operational needs covered by at least one 9. The Priority Average is 82%, which shows that higher priority capabilities are largely those delivering the direct matches. Overall, the operational fit is strong, with a single gap centred on accelerating purchase orders.

	SUPPORT HOQ					
	DRS OSS FEATURES					
	Feature 11	Feature 12	Feature 13	Feature 14	Feature 15	Priority Average
Priority Rating (1-5)	5	5	4	4	5	92,00%
Business Case Requirements:						**Requirements Check**
Central repository for supplier documents, catalogues and contracts with quick search					9	1
Team communication space linked to items, orders and tasks to cut email volume and improve organisation	3	3	0	3	3	0
Actionable notifications for low stock, reorder due and late deliveries.				9		1
				Requirements Check Average		66,67%

Figure 7.8 — Support HOQ from the Construction Retail Case Study

The Support matrix, Figure 7.8, indicates targeted coverage for content and alerting, with a clear shortfall in collaborative workflow. “Central repository for supplier documents, catalogues and contracts with quick search” attains a 9 against Feature 15. The second requirement: “Team communication space linked to items, orders and tasks to cut email volume and improve organisation” records enabling 3s on Feature 11, Feature 12, Feature 14 and Feature 15. “Actionable notifications for low stock, reorder due and late deliveries” earns a 9 with Feature 14, as the feature’s core is to raise event driven alerts.

The Requirements Check average is 66.67%, reflecting two of three needs covered by at least one 9. The Priority Average stands at 92 %, which shows that high priority features are those providing the strongest support. Overall, the support fit is solid for knowledge access and incident alerting, with the principal gap concentrated on a linked teamwork space that organises communication around items and orders.

MANAGEMENT HOQ						
	DRS EIS - DSS - MIS FEATURES					
	Feature 16	Feature 17	Feature 18	Feature 19	Feature 20	Priority Average
Priority Rating (1-5)	5	4	4	4	5	88,00%
Business Case Requirements:						**Requirements Check**
Demand forecasting by category and supplier to plan peaks and seasonality					9	1
Purchasing performance metrics such as order cycle time and on time delivery				9		1
				Requirements Check Average		100,00%

Figure 7.9 — Management HOQ from Construction Retail Case Study

The Management HOQ shows a clean alignment between managerial needs and the features that satisfy them. “Demand forecasting by category and supplier to plan peaks and seasonality” receives a 9 against Feature 20. “Purchasing performance metrics such as order cycle time and on time delivery” attains a 9 with Feature 19, which consolidates event logs into decision ready indicators for procurement oversight. The remaining features do not directly address either requirement, therefore scored 0.

The Requirements Check Average stands at 100% and the Priority Average at 88%, indicating that high priority managerial capabilities are fully covered. Overall, the managerial fit is strong, with emphasis on planning accuracy and purchasing discipline and no material gaps at this level.

7.4.3 Deliver phase

7.4.3.1 Step 6: Application Score and Unmet Requirements

Table 7.8 — Results Table from the Construction Retail Case Study

AHOQ RESULT CALCULATIONS			
	TOTAL REQUIREMENTS	11	
	Nº of Requirements	House Weight	Requirements Check Average
OPERATIONAL	6	0,55	83,33%
SUPPORT	3	0,27	66,67%
MANAGEMENT	2	0,18	100,00%
		AHOQ VALUE	81,82%

The results table reports six operational requirements, three support requirements and two management requirements, with corresponding house weights of 0.55, 0.27 and 0.18. Applying the house weights to the Requirements Check Average yields a AHOQ applicability value of 81.82%. The pattern indicates a strong overall fit driven by complete coverage of the managerial needs and solid execution coverage at the point of work.

Table 7.9 — Feature Ranking Table from Construction Retail Case Study

FEATURES RANKING					
RANK	FEATURE NAME	HOUSE	PRIORITY RATING	9-MATCH	TIER
1	**Feature 2**	Operational	5	2	1
2	**Feature 1**	Operational	5	1	1
3	**Feature 8**	Operational	5	1	1
4	**Feature 15**	Support	5	1	1
5	**Feature 20**	Management	5	1	1
6	**Feature 14**	Support	4	1	1
7	**Feature 19**	Management	4	1	1
8	**Feature 3**	Operational	3	1	1
9	**Feature 5**	Operational	5	0	2
10	**Feature 11**	Support	5	0	2
11	**Feature 12**	Support	5	0	2
12	**Feature 16**	Management	5	0	2
13	**Feature 7**	Operational	4	0	3
14	**Feature 9**	Operational	4	0	3
15	**Feature 4**	Operational	4	0	3
16	**Feature 10**	Operational	4	0	3
17	**Feature 13**	Support	4	0	3
18	**Feature 18**	Management	4	0	3
19	**Feature 17**	Management	4	0	3
20	**Feature 6**	Operational	2	0	3

Tier 1 is led by Feature 2 with two 9-matches, followed by Feature 1, Feature 8, Feature 15, Feature 20, Feature 14, Feature 19, and Feature 3. Tier 2 comprises Feature 11, Feature 12, Feature 16, and Feature 5, all priority five but without direct matches. Tier 3 includes Feature 7, Feature 9, Feature 4, Feature 10, Feature 13, Feature 18, Feature 17, and Feature 6. The pattern confirms an operational-first fit with targeted managerial support, while collaboration and ordering remain the main levers for improvement.

7.4.3.2 Step 7: Dashboard with Results

For confidential reasons the dashboard and suggestions for unmet requirements is removed.

7.5 Cross-Case Comparison

This chapter brings the three cases together and compares them side by side using the same criteria. Starting with the introductory questions, TV Production and Nursing respondents report less than a year of experience, while Construction Retail reflects a senior profile with more than ten years, which can have a toll on the answers given. Paper intensity is light in Nursing and TV Production, scoring one and two, and heavy in Construction Retail at four, while perceived digital support sits at mid-level across all three, signalling partial support and a degree of isolation in daily work. Access to decision tools is rated higher in TV Production at four, compared with three in Nursing and Construction Retail.

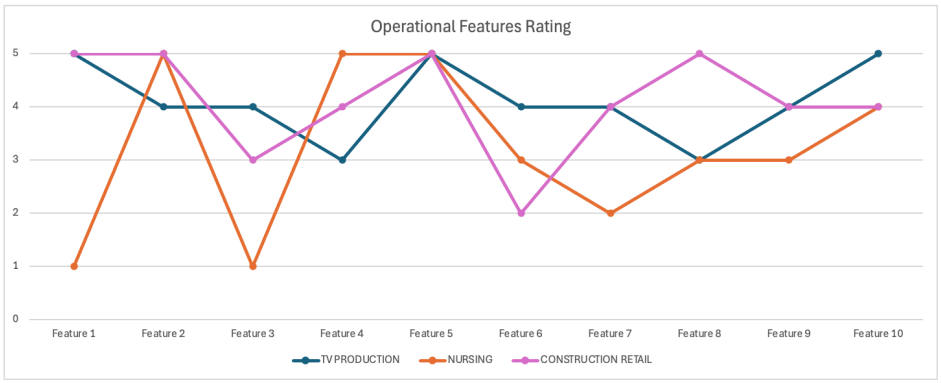

Figure 7.10 — Operational Features Rating from the three Case Studies

Figure 7.10 shows operational features ratings, presenting a mixed picture across the three cases. The mean across the ten features is 3.8, indicating broadly positive yet uneven fit. Only one feature is identical across all three, with Feature 5 rated five in each case. Case averages reinforce the pattern of TV Production and Construction Retail both averaging 4.1, while Nursing averages 3.2. TV Production prioritises Feature 1 and Feature 10, Nursing emphasises Feature 2 and Feature 4, and Construction Retail stands out on Feature 8 while rating Feature 6 lower. These contrasts reflect different operational emphases across settings.

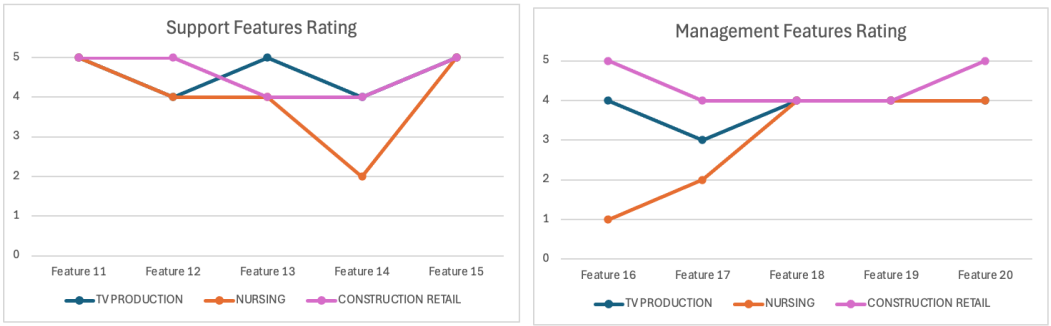

Figure 7.11 — Support and Management Features Rating from the three Case Studies

Support ratings are strong and broadly aligned throughout the three-case averaging a strong rating of 4.4. There are two equal matches across all three cases: Feature 11 and Feature

15 are both rated five, signalling a shared core around in-platform communication and knowledge access. Case means are higher for TV Production and Construction Retail at 4.6 each, with Nursing at 4.0. Variation is concentrated in Feature 14, rated two in Nursing versus four in the other two cases, and in Feature 12 where Construction Retail assigns five and the other cases assign four.

On the other hand, management ratings are more uneven. The group average is 3.7 and there are two equal matches across all three cases: Feature 18 and Feature 19 are rated four. Case means separate clearly, with TV Production at 3.8, Nursing at 3.0 and Construction Retail at 4.4. The widest spreads appear on Feature 16 (four, one and five respectively) and Feature 17 (three, two and four), while Forecast draws higher emphasis in Construction Retail at five compared with four elsewhere.

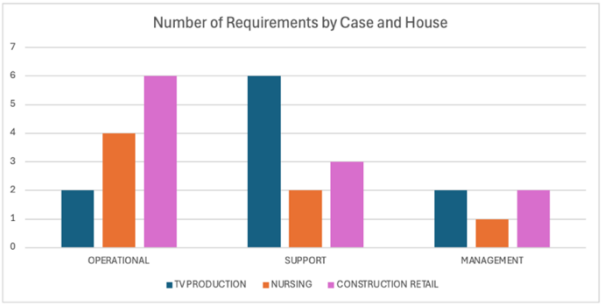

Figure 7.12 — Number of Requirements by House from the three Case Studies

The distribution of requirements differs sharply across houses and cases, shown in Figure 7.12. TV Production is Support-led, with six Support requirements against two Operational and two Management, which matches its emphasis on coordination and information flow. Nursing reverses this pattern, placing most attention on Operations with four requirements, two in Support and only one in Management, consistent with point-of-care execution needs. Construction Retail shows the largest set overall with eleven requirements, dominated by six Operational items, three in Support and two in Management, reflecting workload around stock and process control with defined managerial oversight. Across all three cases, Management requirements are few, which suggests that managerial needs are narrower and more specific, while Operational and Support demands drive most of the required change.

Table 7.10 — Ranking Table from the three Case Studies

		RANK				
		TV Production	Nursing	Construction Retail	AVERAGE	SPREAD
OPERATIONAL	Feature 1	4	18	2	8,0	16
	Feature 2	15	1	1	5,7	14
	Feature 3	18	19	8	15,0	11
	Feature 4	19	4	15	12,7	15
	Feature 5	8	5	9	7,3	4
	Feature 6	17	12	20	16,3	8
	Feature 7	16	15	13	14,7	3
	Feature 8	20	13	3	12,0	17
	Feature 9	13	14	14	13,7	1
	Feature 10	2	6	16	8,0	14
	AVERAGE	13,2	10,7	10,1	11,3	10,3
	TOTAL	-	-	-	-	-
SUPPORT	Feature 11	3	2	10	5,0	8
	Feature 12	9	7	11	9,0	4
	Feature 13	7	8	17	10,7	10
	Feature 14	5	16	6	9,0	11
	Feature 15	1	3	4	2,7	3
	AVERAGE	5	7,2	9,6	7,3	7,2
	TOTAL	-	-	-	-	-
MANAGEMENT	Feature 16	14	20	12	15,3	8
	Feature 17	6	17	19	14,0	13
	Feature 18	10	9	18	12,3	9
	Feature 19	11	10	7	9,3	4
	Feature 20	12	11	5	9,3	7
	AVERAGE	10,6	13,4	12,2	12,1	8,2
	TOTAL	-	-	-	-	-

Taken with the earlier figures, Table 7.10, again shows that the three cases bear little resemblance to one another. Operational priorities diverge most, with an average spread of 10.3, with large flips on Feature 8, Feature 1 and Feature 10. Support is steadier yet still disagrees on Feature 14, with only Feature 15 staying consistently high.

Deriving from the ranking and the nine-matches found, the tier results show a stable Support core with Feature 15 achieving Tier-1 in all cases. Operations splits by context, with Construction Retail strongest overall while Management reaches an all-time low in the Nursing Case, where every feature achieved a 3-tier ranking.

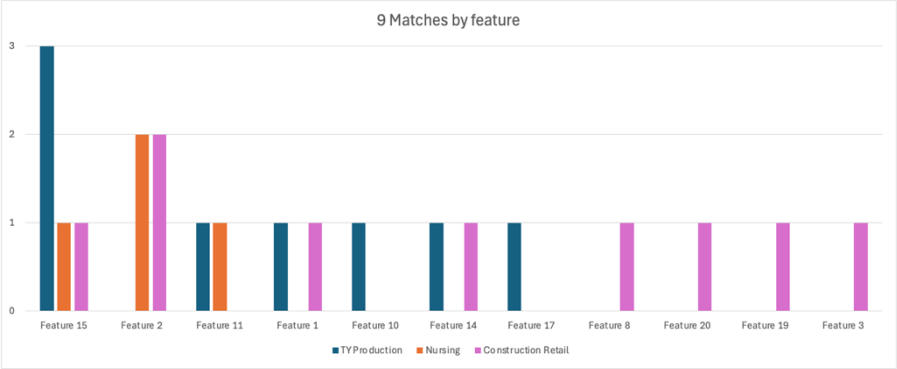

Figure 7.13 — 9 Matches by feature from the three Case Studies

The nine-match pattern also shows a small common core. Feature 15 registers in all three cases, while Feature 11 appears in two. Depth outside TV Production sits with Feature 2 in Nursing and Construction Retail. Construction Retail concentrates most of the unique nine-matches, whereas TV Production's are spread across Support and Operations.

7.6 Interpretation of Results

When interpreting the AHOQ results, the absence of a 9 does not mean a feature lacks value as it indicates only that the interviews did not reveal a requirement that the feature satisfies directly. Many features act as enablers that shorten workflows, improve reliability or secure compliance, and these typically attract 3s in the matrices. A 0 reflects no direct alignment with the needs elicited at that moment rather than irrelevance to the sector. However, for example, feature 12 never receives a 9 throughout the 3 cases, yet it is an essential feature.

It is important to understand that the model is designed for gap analysis rather than for ranking intrinsic worth. Each House of Quality links specific, context bound requirements to available capabilities and exposes where coverage is direct, enabling or absent. The AHOQ figure aggregates that evidence into an applicability statement. In practical terms it means only this: "At the time of data collection the DRS can fit a given percentage into the sector under review according to the requirements mentioned. Changes in priorities, configuration or scope would legitimately alter the score."

The interview mode was varied on purpose to test whether the way needs are elicited shapes the requirement set. An interesting outcome is that the nursing phone interview produced the fewest requirements, while the construction retail video call yielded the most. This pattern may reflect the richer cues and shared artefacts available with video contact, although experience is a confounding factor since the construction participant had over a decade in role. On balance, video or in person conversations appear preferable for breadth and depth of capture.

7.7 Decision Making Process for Sector Selection.

After examining the three cases in depth, the comparison makes one point clear, which is that each case is different in its own way. It is clear to see that priorities shift with context and the balance between Operations, Support and Management, never settling into a single pattern.

On measured fit, Construction Retail is the strongest candidate for a first adaptation. Its AHOQ result is about 81.8%, narrowly ahead of TV Production at about 80% and well above Nursing at about 57.1%. Just as important, Construction Retail still revolves around selling and stock, which keeps it close to the DRS's native retail environment with the required extensions being product centred. TV Production follows closely with a concentrated strength in Support. A clearer team communication space and a lightweight performance and feedback loop would close most of the gaps. Nursing remains the most demanding path as the lower AHOQ score reflects the need for real time treatment tasking, bedside documentation and a management feedback loop.

Regardless, after running ASYS, stakeholders should still weigh the programming effort and governance overhead before committing to a first sector. Healthcare carries greater

bureaucracy and a higher compliance burden, that places it behind the other two for an initial adaptation.

In sum, Construction Retail is the right first step because it combines the best measured fit with a setting that resembles the DRS's home context, then TV Production can follow quickly on the strength of a support led package and finally, nursing becomes attractive once the clinical extensions are ready and the organisation is prepared for the additional oversight that healthcare requires.

8

CONCLUSION

8.1 Answers to the Research Questions

To completely reach a final point in this dissertation, it is to essential check if the research questions laid out in the beginning are now fully answered.

RQ 1.1: What is the DRS's value proposition?

For RQ1.1, VCW Framework was used for the first time, in this thesis, as they already had a specific structure to build a strong value proposition. Containing three sections, the captation, the short paragraph and the proof points, this framework cautions not to confuse a value proposition with just a slogan or brand strategy, therefore, after iterations, the removal of the short paragraph and renaming the proof points by Advantages, the DRS's Value Proposition results in:

Value Proposition: "A digital system to streamline store operations and empower frontline performance."

Advantages:

For confidential reasons, the advantages were removed.

RQ 1.2: How can the functionalities of the DRS application be characterised?

To be able to characterise the functionalities of the DRS, it was required to write a detailed description of each feature to deepen the understanding of the app. Continuously, after acknowledging that the DRS fits the Information System category, a pyramid was found dividing these Information System into five different levels (Transaction Processing System, Office Support Systems, Management Information Systems, Decision Support Systems, Executive Support Systems), which were previously explained, in a careful manner.

Once the features and the five different levels were understood, the division started, since not every the DRS feature stood on the same level of the pyramid. Resulting in the following list:

For confidential reasons, the list was removed.

Analysing the list, two major problems surfaced. An imbalance towards TPS features and some duplicated features across levels. To reduce complexity while preserving intent, duplicated features were assigned a primary level, as explained earlier and then features were grouped into three tiers that reflect how the platform operates in practice. The three groups are Operational, which fits TPS features, Support, focusing on OSS features and Management, which encapsulates MIS, DSS and EIS features. The outcome is the list presented below:

For confidential reasons, the list was removed.

This research question became the base block where the rest of the thesis was built on. The division of features into the three groups was followed until the end. Nonetheless, to answer the RQ 1.2 in a systematic manner, a detailed understanding of each feature was first established before identifying a pyramid framing that was subsequently customised and applied to characterise the DRS's functionalities.

RQ2: How can the information system needs of the customer be defined in a structured and reliable way?

This dissertation defines the information system customer needs through a questionnaire administered as a guided interview. To build this questionnaire the main support was the DIANA Framework a variant of the Value Creation Wheel Framework. DIANA presents a problem-solving logic that can be customised to fix a wide range of complications. With five direct and simple steps: DEFINE, INCREASE, ASSESS, NARROW and ACT, this tool helped streamline and configurate the questionnaire used to obtain the essential data used on the rest of this thesis.

The questionnaire mirrors the three levels created in RQ 1.2, Operational, Support and Management. In practice the interview starts with simple identification questions, then interviewee's rate the DRS's features one to five and finally four open ended question precisely aimed at problems, pain points and struggles of the interviewees day-to-day work life. A standardised script was done, explaining the purpose, sequence and expectations, to prevent from derailing and to keep clarity and consistency across interviews. When the interview is completed, the recording of such is listened to and studied, so the open-ended question can be translated into precise stand-alone requirements and placed within the three domains. The outcome is a set of requirements for the sector in study, and a strong idea of how the same sector evaluates the DRS features. The outcome is a clear profile of how that sector evaluates

the DRS's features and a sector grounded set of information system needs, organised within a consistent three level frame.

RQ3: How can a methodology be developed to score the applicability of the DRS to a business scenario?

With the intent of developing a score for the applicability of the DRS to different business scenarios, the Applicability Houses of Quality (AHOQ) was created. Adapted from the House of Quality methodology, the AHOQ judges how well the DRS fits in different sectors by linking customer requirements, the ones gathered in the interview, with the DRS features in a direct and auditable way. The structure derives from the three levels which are now associated with three different Houses of Quality, the Operational house, assessing frontline and transaction-centred functionalities, the Support house, addressing coordination and administrative enablers and the Management house, covering analysis and decision support. Each house contains the DRS features previously assigned to them.

Adjusts were made to the classical House of Quality, tailoring the tool to an applicability task rather than product design. The importance band beside the customer requirements was removed and relocated to the DRS features as a priority row, to allocate the ratings that interviewees shared throughout the interview, the reason for this choice is also because any requirement coming from the customer should have the same importance, which is the highest. The correlation roof, competitor benchmarking and target values are omitted to avoid unverifiable assumptions and because correlations and engineering targets are not the decision lever in this context. The model was implemented in Microsoft Excel to support transparency and replication. At House level, interpretation is guided by two summary indicators, the Priority Average and the Requirement Check Average, reporting the share of requirements covered by at least one full match.

To use the AHOQ model, first the requirements and the DRS features ratings need to be added and then a crossmatch analysis is done. Relationships between features and requirements follow the standard 0-3-9 scale from the Quality Function Deployment methodology. A score of zero indicates no coverage, a 3 means partial coverage or a slight possibility of fixing the issue and a score of 9 shows full coverage, this score also includes cases that still need minor sector specific adjustments. Also, once a requirement obtains a 9 that requirement is now "fixed" so there's no need to evaluate any feature the remaining cells in that row are closed, since further evaluation is unnecessary. Each row records a Requirement Check of 1 when a 9 is present and 0 otherwise, and the Requirement Check Average summarises the proportion of satisfied requirements. Carrying on, the final applicability score, described as the AHOQ Value, aggregates coverage across the three Houses using weights that mirror the distribution of extracted requirements. These weights are calculated by the division of the number of requirements from each house and the number of requirements in total. The AHOQ Value then results in the sum of the multiplication of the House Weights and the House's Requirement Check Average. Adding to the main result a final step converts the matrix

outputs into a clear tier ranking of all the features. Tier one belongs to features that achieved a 9-Match from the crossmatching, tier two is for features that gathered a 5 out of 5 on the interview but did not get a 9 and then tier 3 contains the remaining features ordered by priority.

Building on this methodology, the final step is to construct a concise, decision-ready dashboard that synthesises the principal results of the case study for ease of interpretation. The dashboard comprises the reported AHOQ Value, a summary of the five highest-priority features, and a set of unmet requirements accompanied by corresponding suggestions.

To finalise RQ3, the AHOQ is embedded in a seven-step framework called Applicability System (ASYS). The process encompasses three phases, starting with the discover phase, ASYS begins with sector understanding and access to an informed participant, proceeds to the model phase that goes through interview administration and requirement synthesis, and then applies the AHOQ scoring, ending with the deliver phase that analyses the model and draws the final dashboard.

8.2 Limitations of the Study

Even though the study was completed with success some limitations appear during the empirical phase that ultimately qualify the interpretation of results. Concerning the interviews, an attempt was made to secure a participant nominated by the company, whether an employee or an external contact identified by the company, yet no candidate could be confirmed within the available time, consequently, all interviewees were arranged from the researcher's network and most had limited professional experience, which narrows the range of perspectives and may temper the depth of sector-specific insight

The feature-rating exercise required respondents to infer contextual fit for functionalities that may not exist in their environment, which introduces response bias and variation in how items were interpreted at the moment of rating.

The applicability model reflects only those requirements articulated by interviewees. Needs that were not recognised or verbalised remain outside the matrices, which narrows coverage and indicates that the reported fit represents a conservative view of what the DRS could address in each context, this does not mean that the DRS won't fit those environments, just that often times the model needs to be perceived as a gap analysis, to help adapt it to various scenarios.

Finally, several suggestions for unmet requirements were based on reasoned assumptions, which were later checked with the company advisor, about the DRS's capabilities. These assumptions, yet practical implementation still depend on development priorities and resource allocation.

8.3 Future Research

Prior to closing, this thesis sets out directions for future research. Future work should respond to The company' request of: "How can we sell the DRS to other sectors? What is the best business model for this application?". Therefore, an investigation should be undertaken comparing different scenarios and business models.

Toward ASYS and the AHOQ model a broader and more specialised participant base would strengthen validity. To fulfil the VCW suggested stakeholders list an involvement of company nominated experts and external stakeholders across frontline, supervision, IT, quality and finance would widen perspectives and improve relevance. Additionally, participation from experienced professionals in each sector should be complemented by an expert panel to validate requirement lists, refine terminology and stress test assumptions. This design would sharpen the instrument, reduce misinterpretation during feature rating, and increase confidence that elicited needs and mapping decisions retain meaning beyond a single case.

After applying the model to multiple scenarios, future research should consolidate results across several cases in an effort to understand common patterns in requirement patterns and create a sector typology from which reusable DRS configurations can be proposed. Alongside this, ongoing care for user experience is still a necessity to support a continuous, incremental product improvement.

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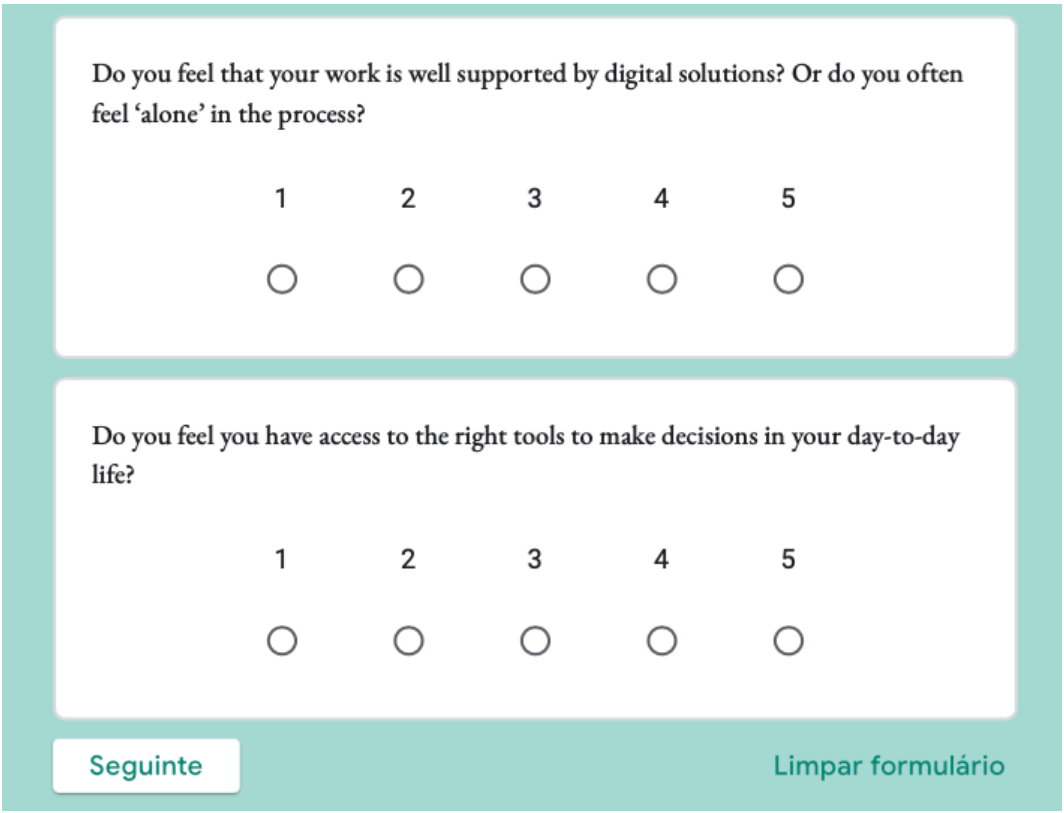
APPENDICES

A

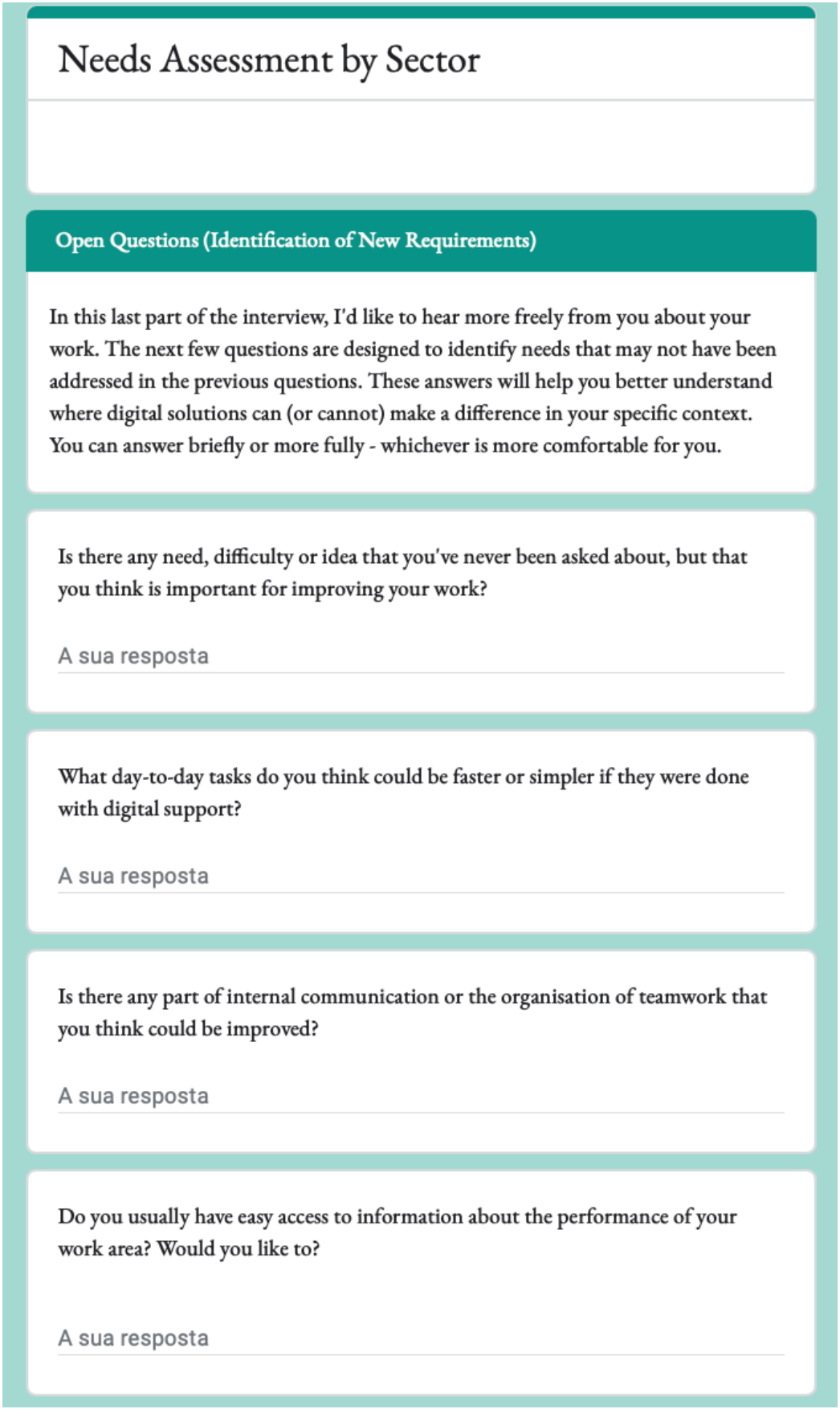
QUESTIONNAIRE

A.1 Questionnaire



Appendix Figure 1 — Introduction pt.2

For confidential reasons, DRS related questions were removed.



Appendix Figure 2 — Open ended Questions

B

AHOQ Model

B.1 Support HOQ

		SUPPORT HOQ					
		DRS OSS FEATURES					
		Feature 11	Feature 12	Feature 13	Feature 14	Feature 15	Priority Average
	Priority Rating (1-5)						
Business Case Requirements:							Requirements Check
Sector Requirements 1							
Sector Requirements 2							
Sector Requirements 3							
....							
					Requirements Check Average		

Appendix Figure 3 — Blank Support HOQ

B.2 Management HOQ

		MANAGEMENT HOQ					
		DRS EIS - DSS - MIS FEATURES					
		Feature 16	Feature 17	Feature 18	Feature 19	Feature 20	Priority Average
	Priority Rating (1-5)						
Business Case Requirements:							Requirements Check
Sector Requirements 1							
Sector Requirements 2							
Sector Requirements 3							
....							
					Requirements Check Average		

Appendix Figure 4 — Blank Management HOQ

2025 DIOGO FONSECA DEVELOPING A FRAMEWORK TO EVALUATE THE APPLICABILITY OF A DIGITAL RETAIL SOLUTION TO VARIOUS BUSINESS SCENARIOS.

NOVA SCHOOL OF SCIENCE & TECHNOLOGY