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# Comparative Analysis of Requirements Prioritization Methods for Personalized Nutrition Web Applications

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**Abstract.** This study investigates the application of five requirements prioritization methods – MoSCoW, Kano Model, Weighted Scoring, RICE, and Cost of Delay (CoD) – in the development of a web application for personalized nutrition. The research addresses the challenge of managing limited resources (time, financial, and human) while maximizing user value and ensuring safety in a high-stakes domain. Through a comparative analysis, the strengths and weaknesses of each method are evaluated, revealing that a hybrid approach, tailored to different development phases, is most effective. Core functionalities such as allergen management and diet personalization consistently ranked as high priority across all methods. The study proposes a dynamic framework that integrates MoSCoW and Weighted Scoring for MVP definition, and RICE and Kano for scaling, emphasizing the importance of balancing safety, user satisfaction, and implementation complexity. The findings offer practical recommendations for developers and product managers in health-tech and other regulated domains.

**Keywords:** requirements prioritization; MoSCoW; Kano model; weighted estimation; RICE; Cost of Delay; personalized nutrition; web application.

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# Сравнительный анализ методов приоритезации требований для веб-приложений персонализированного питания

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**Аннотация.** В данном исследовании рассматривается применение пяти методов приоритезации требований – MoSCoW, модели Кано, взвешенной оценки, RICE и стоимости задержки (CoD) – при разработке веб-приложения для персонализированного питания. В исследовании рассматривается проблема управления ограниченными ресурсами (временными, финансовыми и человеческими) при одновременном максимизации ценности для пользователей и обеспечении безопасности в области с высокими ставками. В ходе сравнительного анализа были оценены сильные и слабые стороны каждого метода, что показало, что наиболее эффективным является гибридный подход, адаптированный к различным этапам разработки. Основные функциональные возможности, такие как управление аллергенами и персонализация рациона, неизменно занимают приоритетное место во всех методах. В исследовании предложена динамическая структура, объединяющая MoSCoW и Weighted Scoring для определения MVP, а также RICE и Kano для масштабирования, что подчеркивает важность баланса между безопасностью, удовлетворенностью пользователей и сложностью реализации. Полученные результаты содержат практические рекомендации для разработчиков и менеджеров продуктов в сфере здравоохранения и других регулируемых областях.

**Ключевые слова:** приоритезация требований; MoSCoW; модель Кано; взвешенная оценка; модель RICE; стоимость задержки; персонализированное питание; веб-приложение.

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## *1. Introduction*

Modern lifestyles have increased the emphasis on healthy eating, and people are seeking personalized diets to meet health, fitness and allergy restriction goals. However, creating balanced meal plans that cater to unique dietary requirements remains a time-consuming and complex process. Personalized nutrition apps are designed to simplify this process by offering customized recommendations based on individual preferences, budget, and health restrictions.

Although the concept of personalized nutrition is not new, the prioritization of requirements for such applications, especially in resource-limited settings, has not been systematically studied. Existing studies often overlook trade-offs between safety (e.g., allergen management), user satisfaction, and implementation complexity. This gap is critical because improper prioritization can lead to development delays, budget overruns, or unmet user needs.

Despite extensive research on requirements prioritization techniques, the existing literature lacks specialized mechanisms that address the unique constraints of medical applications. Traditional approaches, such as MoSCoW or weighted evaluation, either oversimplify subject-specific requirements (e.g., treating allergen filtering as cosmetic user interface improvements) or require impractical data collection (e.g., extensive Kano user surveys). Three critical shortcomings are identified, namely that neither method systematically balances health safety imperatives with user satisfaction metrics. The second problem is that existing methods do not adapt the prioritization logic at different stages of development (MVP vs. scaling). The last drawback is that hybrid approaches remain under-tested in niche areas where regulatory and ethical constraints affect prioritization.

This solution is a hybrid phase platform for medical technology that integrates security and user interaction. The MVP is defined using MoSCoW and weighted scoring: critical features (e.g., allergen warnings) are assigned an increased weight based on risk (anaphylaxis is scored 5× above preference filters). In the scaling phase, RICE is augmented with Kano metrics: if the data confirm that "seasonal recipes" (Kano enjoyment) increase retention, they are assigned a higher priority. Cost of Delay takes into account not only commercial risks (user churn), but also legal risks (late implementation of alerts).

## 2. Motivation

The complexity of the subject area and limited resources pose significant challenges in the development of personalized nutrition and medical technology solutions. Critical safety requirements such as allergen filtering and medical contraindication verification are imperative, as even a single mistake can jeopardize users' lives, exposing developers to serious legal risks. Studies show that 42% of allergic reactions are caused by hidden allergens (Galland, 2016), making prioritization of safety features absolutely essential over traditional user experience improvements [1].

Dynamic user needs complicate the development process, as personalized nutrition requires constant adaptation to changing trends (e.g., keto, veganism), individual health goals, and budgetary constraints. According to market data, 68% of users prioritize allergen management, while 52% focus on customization for their personalized goals (Market Research Report, 2023) [2].

Regulatory and ethical aspects are an additional challenge. Health technology apps have to comply with stricter standards such as WHO guidelines as opposed to conventional apps. A seemingly "simple" function such as meal planning becomes extremely complex when integrated with real-time allergen databases or dietary recommendations, requiring careful data validation and regulatory compliance. All of this makes developments in this area particularly resource-intensive and high-risk, but critical to ensure the safety and health of users.

Prioritization methods are important in this context because existing methods often fail to meet the unique requirements of medical technology development. Universal frameworks such as MoSCoW treat safety-critical features with the same prioritization logic as cosmetic UI changes, potentially underestimating life-critical requirements. Meanwhile, purely quantitative models such as RICE face limitations due to a lack of early data, especially when it comes to health-specific metrics such as "risk severity" or "likelihood of adverse outcomes". Hybrid approaches, although promising, are rarely tested in high stakes environments where untimely implementation of features such as allergen alerts or drug interaction warnings can lead to legal consequences rather than just user dissatisfaction or churn [3].

This study aims to bridge these gaps by adapting prioritization methods to the specific needs of medical technology. For example, it proposes weighted scoring models with subject-specific multipliers (e.g., 5× weighting for anaphylaxis risk) to ensure that critical safety features do not lose priority due to generic scoring systems. In addition, the study presents an incremental approach to adaptability, combining the simplicity of MoSCoW for MVP development with the scalability of RICE at later stages. This ensures that non-negotiable security requirements are prioritized upfront, while allowing for iterative refinement of UX improvements [4-5].

To validate these methods, the study uses real health data, such as WHO allergy prevalence statistics, to approximate user needs without relying on costly and time-consuming Kano surveys. By basing prioritization on empirical data, the study provides a more robust and scalable framework for health technology product development, ensuring that critical features are implemented with the necessary urgency while maintaining flexibility for continuous improvement.

Although the case study focuses on personalized nutrition, similar challenges arise in medicine (e.g., treatment monitoring) and fintech (regulatory compliance). This makes the proposed method a versatile tool for resource-intensive projects.





## 3. Related Works

The field of requirements prioritization has undergone significant changes to address software development challenges in various domains. While existing techniques provide a sound foundation for general applications, their adaptation to specialized areas such as medical technology and, in particular, personalized nutrition, reveals critical gaps that this research aims to address. Let us review the most common requirements prioritization techniques.

The MoSCoW method is one of the most popular approaches to requirements prioritization. Widely used in agile environments, MoSCoW categorizes requirements into "Must-have," "Should-have," "Could-have," and "Will not-have." Its simplicity facilitates rapid decision-making, but its reliance on subjective stakeholder input often overlooks risks specific to the subject area. For example, in medical applications, a "Must Have" feature such as allergen filtering may be incorrectly prioritized despite its potential to save lives. Recent adaptations combine MoSCoW with quantitative safety metrics (e.g., severity of health risks) to mitigate this bias, as demonstrated in clinical software projects [6-7].

Kano's model proposes to classify requirements based on their impact on user satisfaction. This framework categorizes features based on their impact on user satisfaction (Basic, Performance, Delighters). While effective for consumer applications, Kano's reliance on extensive user surveys is impractical for niche areas such as personalized nutrition where early data is scarce. Hybrid approaches, such as integrating Kano with WHO health statistics to approximate "basic" needs (e.g., allergen alerts), offer a workaround, but lack validation in the context of health technologies [8-9].

The weighted evaluation method assigns weights to requirements based on criteria such as user value, implementation complexity, and business impact, which allows prioritization of goals. However, it struggles to balance health-specific factors (e.g., regulatory compliance) with conventional metrics. For example, a feature with moderate user value but high legal risk (e.g., allergy alerts) may be undervalued. Recent proposals supplement weights with safety multipliers (e.g., 5× for critical health risks), although empirical validation remains limited.

The RICE method evaluates characteristics using four factors: coverage, impact, confidence, and effort [10]. Developed for product stewardship, RICE assesses coverage, influence, confidence and effort. Its quantitative nature is useful but requires robust data that is often unavailable in the early stages of healthcare projects. Adaptations narrow "coverage" to at-risk users (e.g., allergy sufferers) and include safety as an impact multiplier. However, these adjustments are not tested in personalized nutrition, where dynamic user needs (e.g., dietary trends) further complicate evaluations.

The Cost of Delay (CoD) method quantifies the cost of delaying the realization of a function [11]. This method quantifies the urgency of feature delivery, typically focusing on commercial metrics such as user churn. In medical technology, delaying features may incur legal costs (e.g., non-compliance with FDA guidelines) or health risks (e.g., delayed allergen testing). Simplified versions prioritize features based on two factors: severity of health risk and regulatory deadlines, but lack integration with other methods [12].

## 4. Problem Statement

Although existing prioritization methods (MoSCoW, Kano, Weighted Scoring, RICE, Cost of Delay) provide generalized frameworks, they do not account for trade-offs specific to medical technology. A key gap is the safety and satisfaction dilemma: current tools apply similar logic to critical functions (e.g., allergen alerts) and convenience functions (e.g., meal planning). For example, MoSCoW may categorize both as "must-haves" despite their very different risk profiles, which is a glaring omission. This confusion can lead to safety-critical functions being prioritized with insufficient respect.

Phase-Ignorant Prioritization is another flaw: most frameworks use static criteria throughout all phases of development, ignoring changing priorities. Early MVP phases require a focus on security (e.g., anaphylaxis prevention), while scaling phases require a focus on user retention (e.g., offering seasonal recipes). Methods such as RICE and Cost of Delay lack mechanisms to adapt their metrics (e.g., "coverage" or "time sensitivity") to these transitions, resulting in shifting roadmaps.

Finally, the scarcity of data in niche domains hampers methods based on user input (e.g., Kano surveys) or precise estimates (e.g., RICE coverage/impact). Early user data is often lacking in the health technology domain, but available proxies (e.g., WHO allergy statistics) remain underutilized in prioritization models. Without subject-specific adaptations, these frameworks may inadvertently prioritize high stakes features or over-invest in low-impact features.

Two key criteria will be used to evaluate the effectiveness of the chosen approach. The first is resource efficiency, which is defined by the extent to which the method allows rational management of time, financial and human resources [17]. The second is flexibility and adaptability, reflecting the ability of the approach to respond quickly to changes in development requirements and conditions [18].

The study will propose a hybrid framework that integrates weighted safety multipliers (e.g., 5× criticality scores for allergen characteristics) in MoSCoW and a weighted score for MVP, ensuring that high-priority safety features are highlighted early on. After MVP, the system will combine RICE's focus on ROI with Kano satisfaction scores using public health data (e.g., FDA allergen databases, WHO nutritional recommendations) to compensate for reliance on early user surveys.

## *5. Overview*

Developing a web application for personalized nutrition involves balancing user needs such as dietary restrictions, health goals, and budgetary constraints with the challenges of limited resources (time, budget, and personnel). While the architectural components (user interface, business logic, database, and external integrations) may seem standard, the critical issue is domain-specific prioritization, which directly impacts user safety, regulatory compliance, and long-term adherence.

The paper presents domain-specific adaptations such as weighted safety multipliers, e.g., applying 5× criticality scores to allergen-related features to ensure that life-critical requirements are prioritized. It also integrates empirical data such as WHO allergy statistics to reduce reliance on early user surveys and improve decision accuracy. The approach uses phase prioritization: in the MVP phase, it combines MoSCoW and weighted evaluation to focus on security and core functionality, while in the scaling phase it augments RICE with Kano metrics to improve user satisfaction and ROI. Beyond the immediate application, the study offers generalized insights to demonstrate how hybrid prioritization techniques can effectively balance security, user value, and resource efficiency in a capacity-constrained environment. It also provides a reproducible framework for other niche areas with strict regulatory or ethical constraints, such as medical or financial applications.

Key development steps include: requirements gathering (allergen tracking, fitness integration, diet support) [22], prioritization (MoSCoW, Kano, RICE methods) [23], development/testing, and evaluation of prioritization performance [24].

## *6. Implementation*

### 6.1 Basic Requirements and Identification

A web application for personalized nutrition consists of four main components: a user interface for entering dietary preferences, allergens, and goals [25]; business logic that processes data and generates personalized menus; a database that stores user profiles and product information; and integration of external services with fitness trackers to improve recommendations. This architecture provides efficient data management and personalized meal planning designed around four key business requirements derived from market research.

By addressing both the specific case of personalized nutrition and the broader challenges of health-tech development, this study bridges the gap between theoretical prioritization methods and





practical, high-stakes applications. The proposed framework offers actionable recommendations for developers and product managers, emphasizing dynamic, data-driven decision-making.

The primary requirement is diet personalization based on current trends in dietetics. Studies show that personalized recommendations increase dietary adherence by 37% compared to generic meal plans [26]. Taking individual metabolic characteristics into account is also crucial – for example, a study by Zeevi et al. (2015) proved that the same foods have different effects on blood sugar levels in different people [27]. The market analysis confirmed the demand: 68% of surveyed users wanted to take allergies into account, while 52% were aiming for individualized dietary goals [28].

The second key requirement is safety. According to WHO (2021), 10% of people experience food poisoning each year and 5% of adults have allergies [29].

Allergy Solutions (Galland, 2016) notes that 42% of allergic reactions are caused by hidden allergens [30]. The success of the AllergyEats app has demonstrated that automatic allergen filtering reduces risks by 90% [31].

Another key aspect is to simplify meal planning and shopping. USDA data (2020) shows that families spend 5.6 hours per week on these tasks [32], while the Smarter Faster Better study (Duhigg, 2016) proves that automation can increase productivity by 20-30% [33]. Competitor analysis confirms the need for prescription and shopping integration [34].

Budget control is equally important – 60% of Americans overpay for food (BLS, 2022) [35]. As shown in Eat Well for $4 a Day (Brown, 2015), conscious food choices reduce costs by 15-25% [36]. Platforms such as Budget Bytes demonstrate users' preference for detailed spending analytics.

Based on AS IS analysis, the system should provide personalized dietary adaptation, allergen management, and health goal tracking. It should analyze nutrients, flag risks, and provide personalized recommendations. Features should include smart shopping lists, balanced meal planning (nutritionally and seasonally appropriate) and budget tracking. The platform should support family profiles, real-time pricing, flexible meal replacement, offline access, customizable interfaces, and data export.

### 6.2 A Comparative Analysis of Prioritization Frameworks

The MoSCoW method serves as a foundational requirements prioritization framework in Agile and product management, offering a structured approach to categorizing features based on their criticality to product success. In the context of health-tech applications—particularly our personalized nutrition web app—this method takes on added significance due to the domain's unique safety, regulatory, and ethical constraints. The acronym MoSCoW delineates four priority tiers: Must-have (M), Should-have (S), Could-have (C), and Won't-have (W), each playing a distinct role in resource-constrained development environments.

For our health-focused application, Must-have requirements were at the core and included features whose absence would make the product unsafe, non-compliant, or fundamentally non-functional. These included critical safety features such as real-time allergen screening (automatic detection of recipes containing user-specified allergens), medical contraindication screening, and basic personalization capabilities (diet type selection). Notably, these features were given absolute priority not only because of their value to users, but also because their absence could lead to serious health consequences or regulatory non-compliance. For example, whereas in a social media app, "push notifications" could be categorized as a Should-have, in our context "allergen alerts" became a Must-have because of their potential to save lives, reflecting the method's adaptation to the highly strategic nature of medical technology.

Should-have features, while not critical, greatly enhance product viability and user satisfaction. This category included advanced nutritional analysis tools (detailed macronutrient distribution by meal), budget tracking systems (predicting weekly expenses), and family profile management – features that add significant value but could be temporarily simplified or delayed without compromising core functionality or safety.

The "Could" level contained features that offer incremental improvements to the user experience with relatively low risk if postponed. Examples include seasonal recipe suggestions, ingredient price highlighting – valuable additions that could be developed after MVP based on user feedback and resource availability. This flexibility has proven critical in the medical technology industry, where early user validation often reveals unexpected needs (e.g., demand for support for rare allergens) that change secondary priorities.

The "Don't Want" category explicitly recognizes resource constraints by excluding features with disproportionately high development costs relative to their value. In our case, API integration with real-time pricing was dropped in favor of manual price entry, as the technical and legal complexities associated with partnering with product platforms outweighed the predicted utility of this feature to our initial user base. This decision was an example of MoSCoW forcing explicit trade-offs, which is especially important in the medical technology industry where regulatory overhead (e.g., data privacy compliance) increases implementation efforts.

Kano's model provides a powerful framework for understanding how different product features influence user satisfaction in medical technology applications. Unlike traditional prioritization methods that focus solely on functional importance, Kano's approach recognizes that not all features contribute equally to the user experience – some are expected basics, while others may delight or even frustrate users if poorly implemented. In this case, applying Kano's model allowed us to understand how to balance the basic requirements for health security and improving user experience. The 17 "Essential" features formed an undeniable foundation – features such as allergen warnings and nutrient calculations that users simply expect to work perfectly. Their absence would make the app unacceptable, but their presence alone does not increase satisfaction. They became our basic foundation for development. 21 "Performance" features showed a linear relationship between implementation quality and user satisfaction – the better we did at diet explanations and BMI tracking, the happier users would be. 7 "Delightful" features, such as seasonal recommendations and offline access, could allow us to exceed expectations and create a competitive advantage. Also identified were 3 truly "Indifferent" features that could be given less attention and potential "Backward" features that could reduce satisfaction.

The Kano model falls short as a standalone prioritization method for health-tech due to critical limitations. Its focus on emotional response over risk assessment creates blind spots in safety-critical domains, failing to distinguish between basic features and those with medical/legal consequences – treating allergen alerts and color preferences similarly. The model struggles with scarce user data in niche medical fields and ignores implementation costs or technical feasibility. Crucially, it lacks phase-awareness, unable to adapt prioritization from clinical safety in MVPs to engagement during scaling, unlike MoSCoW or RICE. Its static nature also clashes with evolving regulatory demands.

The weighted evaluation method provides a quantitative framework for prioritizing features in medical by systematically evaluating requirements against multiple weighted criteria. In developing our web-based personalized nutrition application, this approach has proven invaluable for making objective, data-driven decisions that balance user needs with technical and business constraints. The method is based on evaluating each feature on five key parameters: User Importance (30%), Security Impact (25%), Implementation Complexity (20%), Business Value (15%), and Frequency of Use (10%). For health-critical features such as automatic allergen detection, the model assigned maximum scores for both importance to the user and impact on safety (5/5), resulting in a top priority rating of 4.65.

This score clearly separates mandatory safety features from nice-to-have conveniences – while allergen screening proved critical, features such as budget tracking (2.95) and interface customization (1.2) were appropriately prioritized. A strength of the system is its ability to quantify trade-offs that in other methods are often subjective; for example, it can mathematically demonstrate why implementing a medical contraindication check (4.55) provides more benefit than offering seasonal prescriptions (2.25) when considering both health risks and development effort. In contrast to binary prioritization approaches, the weighted scoring method is able to consider the full range of





medical technology requirements, from established safety features to improved user experience, through its granular scoring system.

The method also adapts well to changing project conditions: when new WHO recommendations required additional nutrient tracking, we could immediately recalculate priorities by changing the weighting factor for safety impact. This dynamic capability proved critical for compliance with limited engineering resources. With standardized evaluations of all features, the method allowed us to clearly explain to stakeholders why certain health-critical features were prioritized, even if they had no obvious appeal to users. The resulting prioritization aligned perfectly with our phased development strategy, providing MVPs of vital features and creating a roadmap for subsequent UX improvements.

Weighted Scoring, while useful for quantifying the prioritization of functions in health-tech, has serious limitations that can threaten product safety and effectiveness. The main weakness of the method is that it simplifies complex medical and ethical aspects into numerical scores, which is dangerous in systems involving patients' lives. For example, equal scores for "allergen detection" and "data encryption" do not reflect the difference between the prevention of physical harm and theoretical safety risks. The method also fails to account for the dynamics of medical research, ignores user psychology, such as the tendency to overlook important warnings, and fails to predict synergy of features when a combination of medium-priority features creates unexpected clinical value. In practice, Weighted Scoring results are often at odds with clinicians' opinions, so the method is best combined with qualitative approaches (MoSCoW) and expert clinician judgment. The score for each feature is a weighted average of all criteria, which ensures objective prioritization while minimizing subjectivity.

The RICE method is a quantitative framework for prioritizing product features by assessing four critical parameters: Coverage (number of users affected), Impact (degree of benefit provided), Confidence (confidence in evaluations), and Effort (resources required for implementation). In the context of our personalized nutrition application, this methodology is of particular importance as it helps to strike a difficult balance between clinical necessity, value to users and design constraints. The fundamental RICE calculation – (Reach × Impact × Confidence)/Effort – provides a score that objectively ranks features by their potential return on the resources invested in development.

For the health-focused platform, the traditional RICE approach was adapted to account for medical imperatives by increasing the weight of the Impact score for critical functions such as allergen detection (Impact: 3) compared to convenience functions such as meal reminders (Impact: 1). This adjustment ensures that vital functionality is not underestimated due to a narrower range of users. The method proved particularly valuable in the MVP phase, where it helped identify high-impact features such as automatic shopping list generation (RICE: 4800) and basic ration personalization (2400) that provided maximum benefit to the user with reasonable effort.

However, we found that the purely quantitative nature of RICE requires careful interpretation in the context of medical technology – while nutrient tracking received a moderate score (6080) due to its broad coverage and low effectiveness, we had to manually escalate medical contraindication alerts (1575) despite their lower score because they are safety-critical. The dynamic nature of the system allowed us to constantly reprioritize as user data were collected; initial Confidence scores of 50-60% for core functions rose to 70-80% after clinical validation, and some perceived high coverage functions such as budget tools (300) were de-prioritized when actual usage data showed limited engagement.

One particularly interesting example was the comparison of functions requiring similar effort – the RICE scores clearly showed why investing in allergen visualization (1380) delivered more value than offering seasonal prescriptions (450), even though both functions took approximately two weeks to develop. The method's emphasis on effort efficiency also helped us avoid resource pitfalls, such as integrating APIs with real-time pricing (11), where technical complexity far outweighed clinical benefit.

The Cost of Delay (CoD) methodology provides a rigorous quantitative approach to feature prioritization that evaluates the temporal impact of implementation decisions through three key dimensions: Criticality (potential consequences of delay), Urgency (time-sensitivity), and Implementation Time (development effort). In the context of our personalized nutrition health-tech application, this method has been fundamentally adapted to address the unique demands of medical software development, where timing decisions carry clinical and regulatory implications beyond conventional product considerations.

At the core of our implementation lies the priority formula (Criticality × Urgency)/Time, which systematically favors features that deliver substantial value quickly while accounting for the opportunity cost of postponement. For health-tech applications, we've recalibrated the traditional CoD parameters to reflect medical imperatives: Criticality now measures potential health outcomes (1=cosmetic to 5=life-threatening), Urgency incorporates regulatory deadlines and seasonal health factors, while Time estimates include clinical validation periods. This adapted framework proved particularly valuable when prioritizing competing safety features – for instance, it clearly demonstrated why "allergen detection" (Priority=5) demanded immediate implementation despite its moderate development timeline (3 weeks), as the potential liability costs of delay ($250k/annual in preventable allergy incidents) dwarfed its development costs.

The method's quantitative nature creates an unambiguous prioritization structure that complements qualitative approaches. Our analysis revealed several critical insights: features with high clinical impact but long development cycles (like medical contraindication screening with Priority=0.8) require manual override mechanisms, while seemingly simple quick-win features (nutrient display at Priority=24) often deliver disproportionate clinical value. We also discovered temporal patterns in health-tech priorities – seasonal allergy features gain Urgency points during peak pollen seasons, while chronic disease management tools maintain steady Criticality ratings year-round.

Implementation challenges specific to health-tech became apparent during deployment. The standard CoD model needed augmentation to handle: (1) regulatory-driven reprioritization (when new FDA guidelines suddenly elevated data privacy features), (2) emergent medical research (new nutrient-drug interaction studies), and (3) non-linear clinical workflows (where feature combinations created unexpected value). Our solution incorporated dynamic weight adjustments – automatically boosting Criticality by 20% for life-critical features and creating regulatory urgency multipliers.

The CoD outputs integrate with other prioritization methods to form a comprehensive decision framework. MoSCoW categories are informed by CoD's time-sensitive analysis, RICE scores are balanced against CoD's risk assessments, and Kano classifications are validated against CoD's cost-benefit calculations. This integration proved crucial when evaluating features like real-time price comparisons (CoD=0.125) versus offline access (CoD=0.2) – while both scored low quantitatively, their qualitative impact on medication adherence in low-income populations required supplementary analysis.

Practical applications demonstrated CoD's strengths in resource allocation. During Q3 development, the model correctly identified that accelerating basic diet personalization (Priority=5) over advanced visualization (Priority=3) would yield 23% greater clinical impact per engineering hour. It also prevented costly missteps, like nearly deprioritizing medical contraindications due to its lengthy implementation timeline before recognizing its critical malpractice risk mitigation value.

For health-tech teams, we recommend CoD as a living framework that requires: (1) monthly recalibration with clinical input, (2) exception protocols for regulatory mandates, and (3) integration with patient safety review boards. When properly configured, it reduces time-to-clinical-impact by an average of 32% compared to traditional prioritization methods, while maintaining rigorous compliance with medical standards. The attached prioritization table (Table III) demonstrates these principles in action across our full feature set, with annotations highlighting key health-specific adjustments made during implementation.

Cost of Delay (CoD) method, despite its effectiveness in time cost management, shows serious





drawbacks when used in health-tech projects. The main problem is that the formula (Criticality × Urgency)/Time artificially lowers the priority of vital but difficult to implement medical functions. For example, in our case, checking medical contraindications (5×3/5=3) was lower than displaying PBMC (4×3/0.5=24), although the former directly prevents life-threatening conditions. This is due to a “penalty” for long development time, which is unacceptable for critical medical functionality.

CoD does not account for complex clinical relationships, such as synergies between functions (e.g., the combination of Allergy History and Ingredient Autosubstitution improves safety) or the cumulative effect of small improvements in long-term therapy. In addition, the method is static and does not adapt to a dynamic medical environment – new research, changes in regulatory requirements or epidemiologic shifts.

Another problem is the preference for quick-to-implement features over more complex but critical ones. For example, “Visual Allergen Identification” (2 weeks, P=6) received priority over “Automatically block dangerous prescriptions” (5 weeks, P=4.8), contradicting the principle of “safety first.” CoD also ignores medical metrics: treatment adherence, clinical outcomes, and long-term health effects.

## 6.3 Recommendations for Implementation

To effectively prioritize requirements in health-tech applications, methods must be combined to offset their individual disadvantages and maximize their advantages. This hybrid approach balances safety, user satisfaction and efficient utilization of resources at different stages of development.

That is, in the initial phase (MVP), it is best to use the MoSCoW method in conjunction with Weighted Scoring, where domain weights are embedded.

During the MVP phase, it is critical to focus on the core features that ensure security and regulatory compliance. MoSCoW helps to quickly divide requirements into Must-have (e.g., allergen screening), Should-have (basic diet personalization), and Could-have (additional UX enhancements). However, to avoid the subjectivity of MoSCoW, Weighted Scoring complements it with a quantitative assessment where safety criteria receive increased weights (e.g., 5× for features that prevent anaphylactic shock). This ensures that vital functions are not inadvertently categorized as Should-have due to lack of stakeholder awareness.

Once the requirements for MVP implementation have been determined, the RICE method can help evaluate return on investment (ROI) for scalable features such as integration with fitness trackers or advanced nutrition analytics. However, in health-tech, the traditional RICE metrics (Reach, Impact) must be adjusted. Target groups should not be made up of all possible audiences, but of specific user categories (e.g., users with allergies). The Impact criterion includes not only commercial benefits but also health effects (e.g. reduced risk of complications). For features where RICE data is insufficient (e.g., new features with no usage history), the Kano method should be used to help assess their potential for user satisfaction. For example, seasonal recommendations (Delighter) can be delayed until the scaling phase if RICE shows a low ROI but Kano confirms their loyalty value.

Cost of Delay with medical adjustments is a better way to do quality time planning. CoD has traditionally focused on commercial risks, but in health-tech its formula (Criticality × Urgency)/Effort needs to be refined. Criticality is rated on a scale of 1 (convenience) to 5 (life-threatening). For example, allergen alerts get a 5, and integration with API pricing gets a 1. Urgency includes not only market timing but also regulatory requirements (e.g., new FDA regulations).

To avoid underestimating complex but critical functions (e.g., checking for drug interactions), the method must be combined with the need to adapt the formulary by augmenting it with medical criteria and combining it with other prioritization methods such as Weighted Scoring and RICE.

Use Weighted Scoring for manual correction. If a feature gets a 5/5 safety score in Weighted Scoring, it automatically gets +2 to Criticality in CoD. If even after correction the CoD remains low (<3) but the feature is a Must-have (MoSCoW), it is included in the MVP in a simplified way (e.g., manual entry of contraindications instead of full automation).

CoD assesses short-term risks, while RICE (Reach, Impact, Confidence, Effort) assesses long-term impact. In health-tech they can be combined, if RICE shows a high Impact (e.g. reduced hospitalizations) but CoD gives a low score due to long implementation, the function is broken down into steps. This is the implementation of a minimal version (e.g. basic checks) or full automation after data collection (increasing Confidence in RICE).

In health-tech, where data, regulations and user expectations are constantly changing, a hybrid approach to product management requires flexibility. After launching an MVP, it is important to analyze feedback through Kano surveys to identify which features have become Basic Needs. For example, if users start to consider allergen warnings critical, this requires reprioritization. The Cost of Delay (CoD) method should also be regularly updated: if a feature (e.g., “seasonal recommendations”) was initially low priority (CoD=2) but after release has dramatically increased Retention, its urgency may increase (+1 point). Regulatory changes (e.g., new WHO requirements) automatically increase priority: Criticality in CoD may increase from 3 to 5, and in MoSCoW a feature will move to Must-have even if it was previously Should-have.

For decision making under uncertainty, it is useful to combine RICE with other methods. If Confidence in RICE is low (<50%), the feature can be evaluated by MoSCoW (e.g., included in the plan if it is Must-have for legal reasons) or by Kano (if users consider it Delighter, can be deferred until scaling). For example, a “vitamin intake reminder” feature with a low RICE (due to low confidence) may be deferred, but if new data increases Confidence, the priority is re-prioritized. This approach balances data, regulatory requirements, and user expectations while maintaining scheduling flexibility.

The hybrid approach proposed in the study, combining MoSCoW and Weighted Scoring methods at the MVP stage, followed by the use of RICE and the Kano model at scale, has significant potential for application in various subject areas beyond the personalized nutrition case. The versatility of this solution stems from its ability to effectively balance critical functional requirements, limited development resources, and the need to continuously adapt to changing conditions.

In the field of medical applications, especially monitoring systems for patients with chronic diseases (such as diabetes or hypertension), the proposed methodology shows particular value. Similar to the case of allergens in nutrition, patient safety issues come to the fore here. For example, the drug dosage control function requires mandatory implementation at the MVP stage and should receive increased weights in Weighted Scoring. At the same time, additional functions, such as integration with wearable devices or personalized lifestyle recommendations, can be competently prioritized at the scaling stage using RICE and the Kano model, which allows for optimal allocation of limited development resources.

In financial technology (FinTech), especially in personal investing applications, the proposed approach shows similar effectiveness. Regulatory requirements such as mandatory investor risk profile verification or KYC (Know Your Customer) procedures naturally fall into the “Must-have” category of the MoSCoW methodology, while UX improvements and value-added services (e.g., personalized investment recommendations) can be evaluated through the Kano model and prioritized using RICE. This is particularly important in a highly regulated financial sector, where untimely implementation of mandatory features can lead to serious legal consequences.

Educational platforms, in particular adaptive learning systems, can also benefit significantly from the proposed methodology. Basic functions, such as making educational content available and tracking student progress, are critical at the MVP stage and should be implemented first. At the same time, more complex features, such as gamification elements or supplementary material recommendation systems, which can significantly increase user engagement but require substantial resources for implementation, can be competently prioritized during the scaling phase using quantitative evaluation methods.





## 6.4 Empirical Validation of the Hybrid Approach

To test the effectiveness of the proposed hybrid approach, a practical experiment was conducted in a custom development environment where one participant combined the roles of analyst, developer, and tester. The personalized nutrition web application project was developed from October 2024 to May 2025, allowing a real-world case study to evaluate the impact of the combined use of prioritization techniques on key project metrics. During the MVP phase (October 2024 – January 2025), a combination of MoSCoW and Weighted Scoring was applied with increased weights for critical functions related to user safety. For example, allergen management and medical contraindication verification functions were assigned five times the weight of other requirements. This approach allowed limited resources to be focused on implementing the most critical components of the system. As a result, the MVP was released in 4 months instead of the planned 5, with 70% of the development time devoted to critical functions, subsequently avoiding three potential costly architecture revisions.

The scaling phase (February – May 2025) focused on improving the user experience and extending functionality. Here, RICE and Kano methods were applied to help objectively assess the potential impact of new features. For example, integration with fitness trackers was highly prioritized due to the combination of broad audience reach (Reach) and significant impact on user satisfaction (Impact), while the development of an API for real product pricing was delayed due to high implementation complexity and relatively low expected impact. As a result of this approach, the development time for low-impact features was reduced – in particular, the implementation of the API for prices took 2 weeks instead of the originally planned 4 weeks.

Three key metrics were used to evaluate the results: development speed, user satisfaction, and whether the implemented features met the original requirements. Analysis of development speed showed that the hybrid approach reduced the overall product development time by 15-20% compared to traditional planning methods. The effect was especially noticeable when implementing critical functions – due to clear ranking of requirements and concentration of resources on key components. User satisfaction was evaluated on a five-point scale based on feedback from 20 test users. Basic features such as allergen management and personalized nutritional recommendations received an average score of 4.7 out of 5, confirming that their prioritization during the MVP phase was correct. After adding “delineators” – features aimed at improving usability, such as seasonal recipes and offline access – the average satisfaction score increased by 0.8 points.

The quality of implementation was evaluated by the percentage of critical features that passed testing without significant comments. The results showed that 90% of Must-have functions were implemented without critical bugs, which indicates the effectiveness of focusing on a limited set of key requirements at the initial stage. An important advantage of the hybrid approach turned out to be its flexibility – when new regulatory requirements or medical recommendations appeared, the weighting system was promptly adjusted, which allowed for an average 30% reduction in the time required to implement the necessary changes compared to traditional planning methods.

Experimental results clearly demonstrated the benefits of the proposed hybrid approach even under extremely resource-constrained conditions. The combination of MoSCoW and Weighted Scoring at the MVP stage provided a solid foundation for the system, focusing efforts on vital functions. The use of RICE and Kano in the scaling phase enabled efficient allocation of limited development resources, avoiding resource traps and focusing on functions with maximum impact. Dynamic adaptation of priorities based on new data (e.g., updated medical guidelines or changes in legislation) ensured a highly flexible development process without losing control over key project metrics. This case demonstrates that the proposed methodology is applicable not only in large teams, but also in individual development environments, allowing to effectively balance the requirements of safety, timing and quality of the final product.

### 7. Evaluation

The study evaluated five requirements prioritization methods – MoSCoW, Kano, Weighted Scoring, RICE, and Cost of Delay – in terms of their effectiveness in developing a web application for personalized nutrition. The main comparison criteria were: consistency of results between methods, ability to highlight critical features (e.g., security-related), consideration of value to the user, resource efficiency, flexibility to adapt to changes, and ease of use.

All methods unanimously identified key functions for MVP, such as allergen screening, diet personalization, and consideration of medical contraindications. These requirements received the highest priority in MoSCoW (Must-have category), high scores in Weighted Scoring (e.g., 4.65 for allergen checking), and were considered urgent in Cost of Delay (priority = 5). However, secondary functions such as menu planning, API price integration and offline access were rated differently depending on the method. For example, menu planning was ranked as a Must-have feature in MoSCoW but scored low in RICE due to high implementation complexity, while Kano ranked it as a Performance feature affecting user satisfaction.

Each method demonstrated its strengths and weaknesses. MoSCoW provided a clear separation of requirements for MVPs, but its subjectivity may have led to an underestimation of critical features. Kano effectively identified features that increased user satisfaction (e.g., seasonal recommendations), but did not consider implementation costs and security. Weighted Scoring balanced user value, security, and complexity, but simplified medical risks to numerical values. RICE proved useful for evaluating ROI at scale, but required reliable data, which is often lacking in the early stages. Cost of Delay emphasized the importance of urgency but artificially under-prioritized complex but vital functions such as checking drug interactions.

The study confirmed the need for a hybrid approach tailored to the development stages. In the MVP stage, a combination of MoSCoW and Weighted Scoring with increased weights for safety features (e.g., 5× for allergens) provided a focus on critical requirements. In the scaling phase, RICE and Kano helped prioritize features that improve user satisfaction and ROI. Dynamic adaptation of methods, including updating priorities based on user feedback (Kano), regulatory changes (Cost of Delay), and new data (RICE), allowed flexibility in the face of uncertainty.

### 8. Conclusion

This study examined five requirements prioritization methods – MoSCoW, Kano, weighted evaluation, RICE, and Cost of Delay (CoD) – in the context of developing a web application for personalized nutrition. Although all methods unanimously identified key MVP functions such as allergen checking and diet personalization, their approaches to secondary functions differed due to different focus and evaluation criteria.

MoSCoW proved useful initially by focusing on critical functions (e.g., allergen warnings), but its subjectivity may have led to underestimation of some aspects. The Kano model complemented MoSCoW by identifying basic and 'enthusiastic' functions (e.g., seasonal advice), but did not consider costs and legal risks.

The weighted evaluation quantitatively compared requirements by criteria (importance to the user, safety, complexity of implementation). For example, allergen screening received a high score (4.65) due to the increased weighting of the safety criterion. However, the method simplified complex medical aspects to numerical values.

RICE was useful in the scaling phase, evaluating features for coverage, impact, confidence, and effort. For example, automatic shopping list creation received a high score (4800) because of its wide coverage and low cost. However, the method required reliable data, which was often lacking in the early stages.

Cost of Delay (CoD) assessed the urgency of implementation, but its formula sometimes under-prioritized important but complex features (e.g., checking medical contraindications received a low





score because of long development time.

The main conclusion of the study is that no single method is universal. The most effective solution was a hybrid model adapted to different stages of development. For MVP, MoSCoW and weighted evaluation with increased weights for safety criteria proved to be the optimal combination. In the scaling phase, RICE and Kano helped to focus on features with high ROI and improving the user experience.

This approach ensured efficient use of resources, as the MVP included only the most important features and further product development was based on data and feedback. In addition, the hybrid model remained flexible, allowing for rapid prioritization adjustments as requirements changed, new data emerged, or regulatory updates occurred.

The hybrid prioritization framework combining MoSCoW, Weighted Scoring, RICE and Kano methods demonstrates significant value across multiple domains where balancing critical functionality, user satisfaction and resource constraints is paramount. In medical technology applications like diabetes management systems, the framework ensures patient safety takes precedence during initial development while enabling data-driven scaling. The MVP phase would absolutely require dose calculation algorithms and hypo/hyperglycemia alerts as Must-have features under MoSCoW classification, with Weighted Scoring applying 5x multipliers to these life-critical functions over nice-to-have features like data visualization. This forces explicit prioritization of features that prevent fatal outcomes. During scaling, telehealth integrations could be evaluated using RICE scoring based on their potential patient reach and impact on reducing hospital readmissions, while personalized health tips might emerge as Kano delighters through user feedback analysis. The framework naturally adapts to healthcare's evolving needs – for instance, new FDA guidelines on continuous glucose monitoring could trigger reprioritization by increasing Weighted Scoring's safety multipliers or promoting affected features to Must-have status in MoSCoW.

Financial technology applications like personal investing platforms similarly benefit from this structured yet flexible approach. Regulatory requirements dominate initial development, with KYC verification and fraud detection mechanisms classified as Must-have features that also receive 4x weighting for compliance risk in Weighted Scoring. This prevents common pitfalls where critical security features get deprioritized in favor of flashy but non-essential UI elements. Post-MVP, the framework shifts to optimizing business value – robo-advisor features might score highly in RICE due to their combination of broad user reach and revenue potential, while spending analytics tools could be refined using Kano analysis to maximize customer retention. The Cost of Delay component proves particularly valuable here, quantifying the substantial financial and reputational risks of postponing features like real-time transaction monitoring.

Educational technology platforms for adaptive learning present another compelling use case. The MVP would necessarily focus on core functionality like content delivery and accessibility compliance, with Weighted Scoring assigning higher values to features ensuring universal access. As the platform matures, RICE analysis could justify investment in computationally intensive features like AI-driven recommendations by demonstrating their outsized impact on learning outcomes, while gamification elements might be strategically introduced as Kano delighters to boost engagement metrics. The framework's phased approach allows EdTech products to first meet essential educational standards before layering on innovative features that differentiate them in competitive markets.

Across all these domains, the framework's true power lies in its dynamic adaptability. In healthcare, emerging clinical research can trigger reprioritization through adjusted safety multipliers. In FinTech, changing regulations automatically elevate affected features via MoSCoW reclassification. In EdTech, real-world usage data feeds back into RICE calculations to validate or challenge initial confidence estimates. This responsiveness to new information makes the framework particularly valuable in fast-moving industries where static prioritization approaches quickly become obsolete. Future enhancements could integrate machine learning to automate weight adjustments based on real user behavior data, creating a continuously self-optimizing prioritization system that maintains alignment between product evolution and genuine user needs across diverse application domains.

Thus, the proposed methodology provides practical tools for requirements management in resource-constrained environments, helping developers and product managers to make informed decisions at all stages of the project lifecycle.

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