

On Nonfunctional Requirements

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15th IEEE International Requirements Engineering Conference (RE 2007)

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背景

- 非機能要件は、プロジェクトの成功に関わる重要な要因の1つである.
- 非機能要件という言葉は、**20**年以上もの間使われてきたが、どのように文書化するか、検証するかについての定義は存在しない.

目的

- 非機能要件の定義となる考え方を提供することを目的とする.

定義に関する問題点

Table 1. Definitions of the term '*non-functional requirement(s)*' (listed in alphabetical order of sources)

Source	Definition
Antón [1]	Describe the nonbehavioral aspects of a system, capturing the properties and constraints under which a system must operate.
Davis [3]	The required overall attributes of the system, including portability, reliability, efficiency, human engineering, testability, understandability, and modifiability.
IEEE 610.12 [6]	Term is not defined. The standard distinguishes design requirements, implementation requirements, interface requirements, performance requirements, and physical requirements.
IEEE 830-1998 [7]	Term is not defined. The standard defines the categories functionality, external interfaces, performance, attributes (portability, security, etc.), and design constraints. Project requirements (such as schedule, cost, or development requirements) are explicitly excluded.
Jacobson, Booch and Rumbaugh [10]	A requirement that specifies system properties, such as environmental and implementation constraints, performance, platform dependencies, maintainability, extensibility, and reliability. A requirement that specifies physical constraints on a functional requirement.
Kotonya and Sommerville [11]	Requirements which are not specifically concerned with the functionality of a system. They place restrictions on the product being developed and the development process, and they specify external constraints that the product must meet.
Mylopoulos, Chung and Nixon [16]	"... global requirements on its development or operational cost, performance, reliability, maintainability, portability, robustness, and the like. (...) There is not a formal definition or a complete list of nonfunctional requirements."
Ncube [17]	The behavioral properties that the specified functions must have, such as performance, usability.
Robertson and Robertson [18]	A property, or quality, that the product must have, such as an appearance, or a speed or accuracy property.
SCREEN Glossary [19]	A requirement on a service that does not have a bearing on its functionality, but describes attributes, constraints, performance considerations, design, quality of service, environmental considerations, failure and recovery.
Wiegiers [21]	A description of a property or characteristic that a software system must exhibit or a constraint that it must respect, other than an observable system behavior.
Wikipedia: Non-Functional Requirements [22]	Requirements which specify criteria that can be used to judge the operation of a system, rather than specific behaviors.
Wikipedia: Requirements Analysis [23]	Requirements which impose constraints on the design or implementation (such as performance requirements, quality standards, or design constraints).

定義に関する問題点

- 表は**Web**や文献などから選ばれた非機能要件の定義の概要である.
- それぞれの定義には、多くの矛盾点がある.
- 例えば、**Davis**は非機能要件の定義をする際、制約について一切触れていないが、**Robertson**はかなり具体的な制約についての定義を行っている.

分類に関する問題点

- 表の定義に従って非機能要件を細かく分類した際にも、定義者によってカテゴリの数や種類が違ったり、カテゴリが統一されていたりすることがある。

表現に関する問題点

例文A「顧客データへの不正アクセスを防止する」

例文B「権限のない人物が顧客データにアクセスする可能性を5%未満になるようにする」

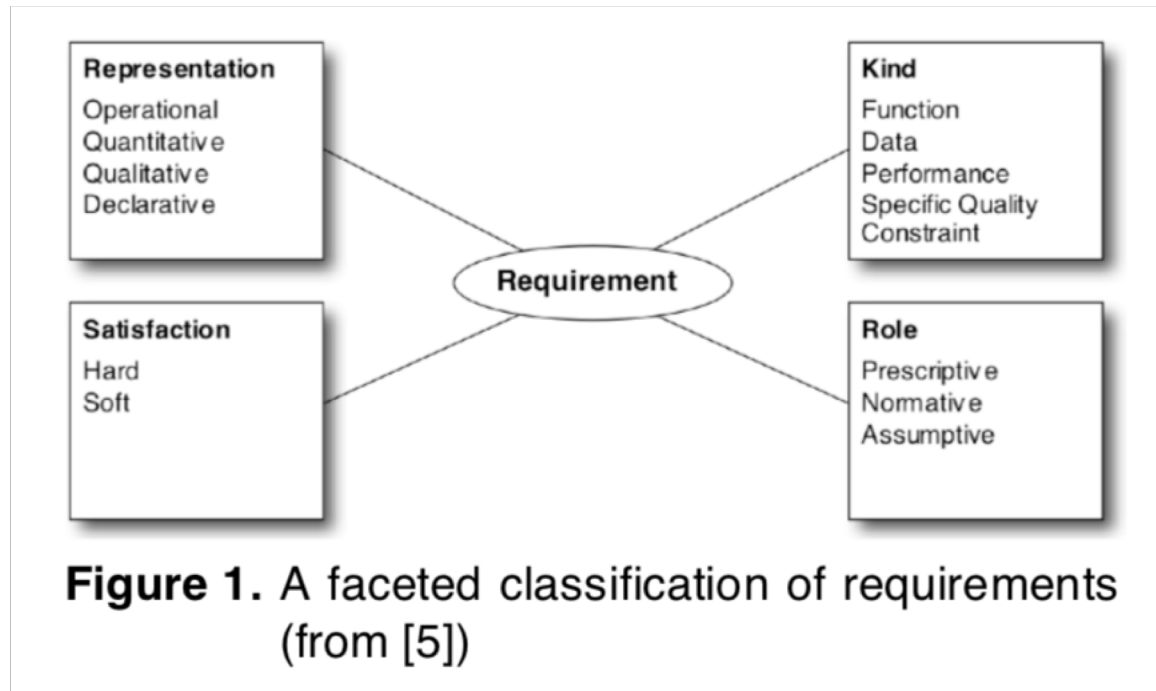
例文A,Bでの表現を表のそれぞれの定義に当てはめてみると、例文は全ての定義において非機能要件と判断される。

表現に関する問題点

例文c「データベースは、顧客データへのアクセスをユーザー名とパスワードで承認されたユーザーにのみ許可する機能を有する」

しかし、同じ内容を意味する記述文でも例文cのような表現になると、機能要件にも該当することとなる。

解決策



解決策

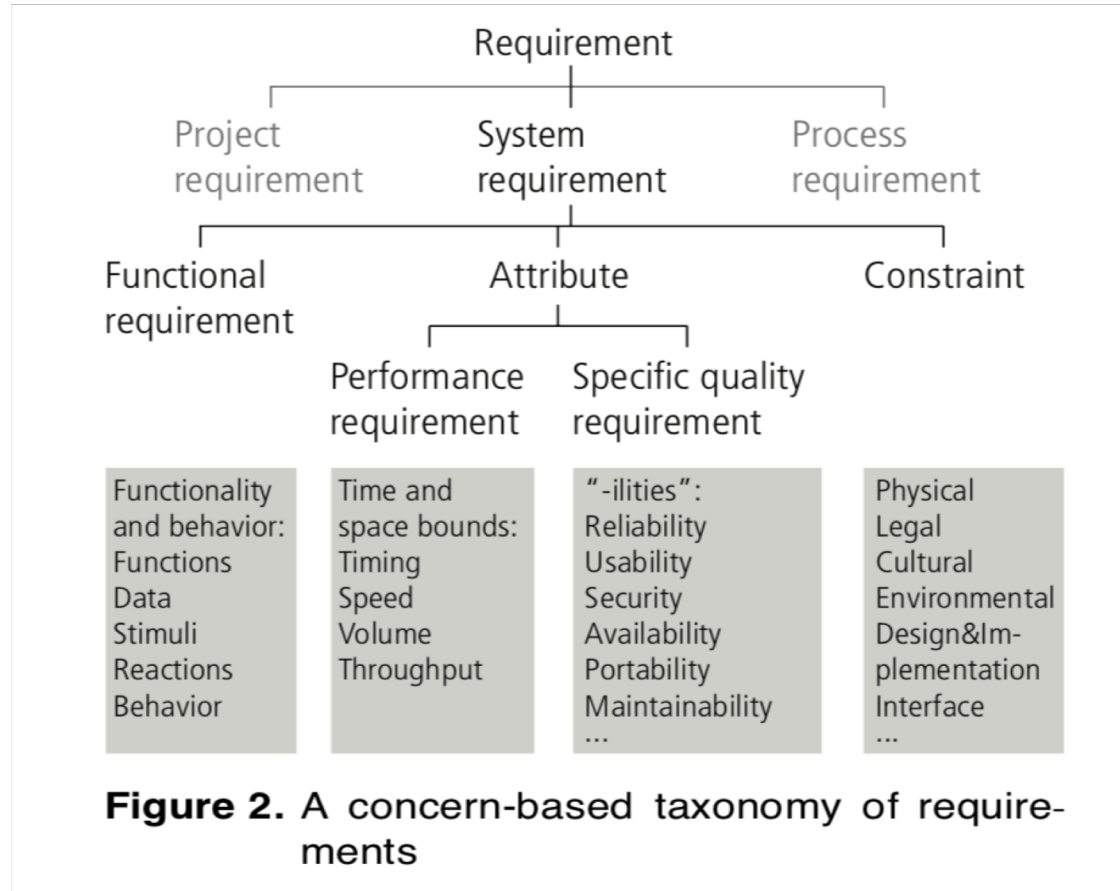
- 定義や分類の問題の解決策としてファセット分類を行う.
- 今回のファセット分類では、要件を大きく4つのカテゴリに分類することで、定義の曖昧性を回避している.

解決策

Table 2. Representation determines verification [5]

Representation	Type of verification
Operational	Review, test or formal verification
Quantitative	Measurement (at least on an ordinal scale)
Qualitative	No direct verification. May be done by subjective stakeholder judgment of deployed system, by prototypes or indirectly by goal refinement or derived metrics
Declarative	Review

解決策



解決策

Table 3. Classification rules

No ¹	Question	Result
	Was this requirement stated because we need to specify...	
1	... some of the system's behavior, data, input, or reaction to input stimuli – regardless of the way how this is done?	Functional
2	... restrictions about timing, processing or reaction speed, data volume, or throughput?	Performance
3	... a specific quality that the system or a component shall have?	Specific quality
4	... any other restriction about what the system shall do, how it shall do it, or any prescribed solution or solution element?	Constraint

¹ Questions must be applied in this order

まとめ，所感

まとめ

- 非機能要件についての新しい定義を提案した.
- 新たな定義を用いることで，表現に依存しない分類を行うことができる.

所感

- 評価実験を行っていないため，他の定義との比較が難しい.
- 非機能要件の説明部分で引用できそう？