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Questionnaire

1 Statistical Data

Survey: Incorporating Sustainability while Taking Software Product Management Decisions

This survey evaluates a list of value aspects that should be taken into consideration for incorporating sustainability while taking software product management decisions. In the given context, these 'management decisions' are all decisions that relate to whether a requirement will or will not be considered during product development. It is an approach to using a catalogue of value aspects for product management decisions for the purpose of supporting different aspects of sustainability during software system development.

We would like you to rate the importance of the following value aspects and provide us with an example from your personal experience wherever possible.

To complete the survey including examples will take you about 10 minutes - your effort is very much appreciated. In case you would like to be informed about the survey's results, we will provide you with the opportunity to leave your email address on the last page of the survey.

For any other issues, please contact Mahvish Khurum at Mahvish.Khurum@bth.se

Would you classify your work as being rather in research, in industry, or both?

- Research
- Industry
- Both

What is your company's size in employees?

- 1-10
- 11-50
- 51-250
- 251-500
- 501-1000
- 1001-2000
- more than 2000

Within the company, what is your product development organization's size in employees?

- 1-10
- 11-50
- 51-250

- 251-500
- 501-1000
- 1001-2000
- more than 2000

What is the main application domain/branch you are most frequently involved with in your projects/research?

- Consumer-oriented software
- Business-oriented software
- Design and engineering software
- Information display and transaction entry
- Operating systems
- Networking / Communications
- Device / Peripheral drivers
- Support utilities
- Middleware and system components
- Software Backplanes (e.g. Eclipse)
- Servers
- Malware
- Hardware control
- Embedded software
- Real time control software
- Process control software (i.e. air traffic control, industrial process, nuclear plants)
- Operations research
- Information management and manipulation
- Artistic creativity
- Scientific software
- Artificial intelligence

Which is your most frequent project role?

- Business Analyst / Requirements Engineer
- Project Lead / Project Manager
- Test Manager / Test
- Architect
- Implementer
- Other

Given your answer in the previous question, how would you classify your experience in that role?

- Novice (up to one year)

- Experienced (1-3 years)
- Expert (more than 3 years)

How do you perceive sustainability in general?

- Very important
- Important
- Somewhat important
- Not important
- I do not know

2 Value aspects for human sustainability

Value aspects for human sustainability

Human capital value refers to the stock of skills and knowledge embodied in the ability to perform labor so as to produce economic value. It is the value of skills and knowledge gained by a worker through experience.

Rationale: For human sustainability, human capital value should be increased by enhancing the skills and knowledge of the developers since they are the work force that develops the system.

Examples: The software developer gets enough time to do his job (they can sustain themselves). The user is not overwhelmed by the interface.

In your opinion, how well is "human capital value" considered today in management decisions?

- It is not considered at all.
- It is hardly considered.
- I don't know how well it is considered.
- It is considered to some extent.
- It is well considered.

In your opinion, how important is it to consider "human capital value" in management decisions?

- It is not important at all.
- It is of little importance.
- I don't know how important it is.
- It is important to some extent.
- It is very important.

Can you provide an example where considering "human capital value" in management decisions from your experience or context might be beneficial?

3 Value aspects for social sustainability

Value aspects for social sustainability

1. Customer capital value refers to the value of relationships that a firm builds with its customers, and which is reflected in their loyalty to the firm and/or its products. It is not reflected in a balance sheet in monetary terms.

Rationale: Loyalty of customers is a stable basis for continuous bonding and customer retention.

Example: The customer wants to stick with the company's products because he values their CSR activities.

In your opinion, how well is "customer capital value" considered today in management decisions?

- It is not considered at all.
- It is hardly considered.
- I don't know how well it is considered.
- It is considered to some extent.
- It is well considered.

In your opinion, how well should "customer capital value" be considered in management decisions?

- It is not important at all.
- It is of little importance.
- I don't know how important it is.
- It is important to some extent.
- It is very important.

Could you provide an example where considering "customer capital value" in management decisions from your experience or context might be beneficial?

2. Network externalities are the amount of other users of the software

product relevant to the focal user, e.g., who might be motivated to use a service due to incentives for the user.

Rationale: If there are incentives for a user to motivate other people to use a service, the user might keep using it for two reasons: the incentive (e.g. lower costs), and the network of users that share the service.

Example: The customer convinces his new friends to use the same social network service as he/she already uses so the new friends can easily be integrated with the old friends.

In your opinion, how well are "network externalities" considered today in management decisions?

- It is not considered at all.
- It is hardly considered.
- I don't know how well it is considered.
- It is considered to some extent.
- It is well considered.

In your opinion, how well should "network externalities" be considered in management decisions?

- It is not important at all.
- It is of little importance.
- I don't know how important it is.
- It is important to some extent.
- It is very important.

Could you provide an example where considering "network externalities" in management decisions from your experience or context might be beneficial?

4 Value aspects for economic sustainability

Value aspects for economic sustainability

1. The **maintainability value** refers to the capability of the software product to be modified. Modifications include improvements or adaptation of the software to changes in environment, and in requirements and specifications.

Rationale: Maintainability of a software product is a foundation for sustainability in a broader understanding, as evolution balances the

factors to be accounted for when aiming at sustainability.

Example: A product can easily be configured to adapt future needs of the user, as opposed to having to create a new release.

In your opinion, how well is "maintainability value" considered today in management decisions?

- It is not considered at all.
- It is hardly considered.
- I don't know how well it is considered.
- It is considered to some extent.
- It is well considered.

In your opinion, how important is it to consider "maintainability value" in management decisions?

- It is not important at all.
- It is of little importance.
- I don't know how important it is.
- It is important to some extent.
- It is very important.

Could you provide an example where considering "maintainability value" in management decisions from your experience or context might be beneficial?

2. The **innovation value** is the practical value of subject technology that is materialized in market (as a product or service) or in business process (as process innovation).

Rationale: Sustainability is a key driver of innovation. If they go hand in hand, innovation has to be supported.

Example: New solutions for greening through IT or making our lives more sustainable in other aspects require innovative products.

In your opinion, how well is "innovation value" considered today in management decisions?

- It is not considered at all.
- It is hardly considered.
- I don't know how well it is considered.

- It is considered to some extent.
- It is well considered.

In your opinion, how important is it to consider "innovation value" in management decisions?

- It is not important at all.
- It is of little importance.
- I don't know how important it is.
- It is important to some extent.
- It is very important.

Could you provide an example where considering "innovation value" in management decisions from your experience or context might be beneficial?

3. The **differential value** distinguishes the differences of a product or offering from others, to make it more attractive to a particular target market. This involves differentiating it from competitors' products as well as one's own product offerings.

Rationale: In order to have sustainable competitive advantage, it is fundamental to strive product features/capabilities that enable economies of development and/or lower profit margins.

Example: If our company is the only one that has a niche product for how to ``Turn your backyard into a food garden'', this software won't have to compete with others on the market but have a sure profit margin from the user group.

In your opinion, how well is "differential value" considered today in management decisions?

- It is not considered at all.
- It is hardly considered.
- I don't know how well it is considered.
- It is considered to some extent.
- It is well considered.

In your opinion, how important is it to consider "differential value" in management decisions?

- It is not important at all.
- It is of little importance.

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- I don't know how important it is.
 - It is important to some extent.
 - It is very important.

Could you provide an example where considering "differential value" in management decisions from your experience or context might be beneficial?

4. Physical value w.r.t. to cost refers to all expenses that the product requires during development, market introduction, and maintenance. A product being developed and marketed with lower development cost will have higher Physical value w.r.t. to cost.

Rationale: For economic sustainability, it is fundamental to keep the development costs as low as possible.

Example: We chose the local hardware producer for our hardware components because that reduced shipping costs.

In your opinion, how well is "physical value w.r.t. cost" considered today in management decisions?

- It is not considered at all.
- It is hardly considered.
- I don't know how well it is considered.
- It is considered to some extent.
- It is well considered.

In your opinion, how important is it to consider "physical value w.r.t. cost" in management decisions?

- It is not important at all.
- It is of little importance.
- I don't know how important it is.
- It is important to some extent.
- It is very important.

Could you provide an example where considering "physical value w.r.t. cost" in management decisions from your experience or context might be beneficial?

5 Value aspects for environmental sustainability

Value aspects for environmental sustainability

1. The **market requirements value** represents the production value with respect to a given market requirement (Time & effort to implement a feature versus requirement's market demand & value).

Rationale: Producing generic products can save resources (such as computers, electricity), as customized solutions may require additional environmental resources.

Example: We did not include the feature to change the background template of the application because only one user ever listed this as requirement for future improvements.

In your opinion, how well is "market requirements value" considered today in management decisions?

- It is not considered at all.
- It is hardly considered.
- I don't know how well it is considered.
- It is considered to some extent.
- It is well considered.

In your opinion, how important is it to consider "market requirements value" in management decisions?

- It is not important at all.
- It is of little importance.
- I don't know how important it is.
- It is important to some extent.
- It is very important.

Could you provide an example where considering "market requirements value" in management decisions from your experience or context might be beneficial?

2. The **physical value w.r.t. cost** represents the production value w.r.t. cost. A product being developed and marketed with lower development cost will have higher PVC.

Rationale: From environmental sustainability perspective, it should be ensured the resources are not wasted (adding to cost) during product development. However, efficiency can only contribute to, but not achieve sustainability by itself.

Example: We decided to use packaging from recycled plastics to ship our products instead of buying regular bubble wrap.

In your opinion, how well is "physical value" considered today in management decisions?

- It is not considered at all.
- It is hardly considered.
- I don't know how well it is considered.
- It is considered to some extent.
- It is well considered.

In your opinion, how important is it to consider "physical value" in management decisions?

- It is not important at all.
- It is of little importance.
- I don't know how important it is.
- It is important to some extent.
- It is very important.

Could you provide an example where considering "physical value" in management decisions from your experience or context might be beneficial?

3. The **sustainability value of technology** means how good or bad a technology is rated with respect to environmental impact due to its own production as well as usage during lifetime and later on for disposal.

Rationale: If a new technology is being implemented, what is the environmental sustainability value of technology? Can it, e.g., increase interoperability possibilities to design more generic products/solutions?

Example: Car sharing systems have a high sustainability value of technology because they require only a comparatively small database system to allow many users to complete their daily chores with fewer

cars.

In your opinion, how well is the "sustainability value of technology" considered today in management decisions?

- It is not considered at all.
- It is hardly considered.
- I don't know how well it is considered.
- It is considered to some extent.
- It is well considered.

In your opinion, how important is it to consider "sustainability value of technology" in management decisions?

- It is not important at all.
- It is of little importance.
- I don't know how important it is.
- It is important to some extent.
- It is very important.

Could you provide an example where considering "sustainability value of technology" in management decisions from your experience or context might be beneficial?

4. Product's intrinsic value includes functionality and quality attributes e.g. usability, reliability etc, of the product.

Rationale: From environmental sustainability perspective, features and quality provided in the product has to be balanced w.r.t. resources used.

Example: The `green shopping assistant' system helps users to decrease their carbon footprint while shopping for their daily groceries.

In your opinion, how well is the "product's intrinsic value" considered today in management decisions?

- It is not considered at all.
- It is hardly considered.
- I don't know how well it is considered.
- It is considered to some extent.
- It is well considered.

In your opinion, how important is it to consider the "product's intrinsic value" in management decisions?

- It is not important at all.
- It is of little importance.
- I don't know how important it is.
- It is important to some extent.
- It is very important.

Could you provide an example where considering the "product's intrinsic value" in management decisions from your experience or context might be beneficial?

In your decision making, which order of impact do you consider for a software product?

First order impacts are direct effects of a software system on its environment, for example energy usage, e-waste production, emissions caused by required infrastructure, etc.

Second order impacts are indirect effects or induction effects caused by software systems, e.g., changes in the users' resource consumption or consumer behavior.

Third order impacts are rebound effects, for example the increased efficiency of IT systems tends to make us use even more IT systems which, in total, consume even more energy.

- We only consider first order impacts (direct effects).
- We consider first and second order impacts (includes also induction effects).
- We consider first, second, and third order impacts (includes also rebound effects).

6 Feedback & Email

Are you aware of other value aspects for sustainability that should be considered but were not in the list

Would you like to leave any other feedback or comments for us?

If you are interested in receiving the results of the survey, please let us know your email adress.

May we contact you in case we have clarification questions?

 Yes
 No

Please feel free to let us know your company name

7 Endseite

Thank you very much for participating in this survey.

We very much appreciate the effort you spent in answering the questions that help us to evaluate the impact of the value aspects for supporting sustainability in product management decisions.

In case you entered your email in the previous page, we will notify you about the results when the survey is completed.

Sincerely yours,

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