GO-MUC: A Strategy Design Method Considering Requirements of User and Business by Goal-Oriented Measurement

Chihiro Uchida, Kiyoshi Honda,
Hironori Washizaki, Yoshiaki Fukazawa
Waseda University
Tokyo, Japan
{c.u.0224,khonda}@ruri.waseda.jp,
{washizaki,fukazawa}@waseda.jp

Kentaro Ogawa, Tomoaki Yagi,
Mikako Ishigaki, Masashi Nakagawa
Yahoo Japan Corporation
Tokyo, Japan
{keogawa,tyagi,miishigaki, masnakag}
@yahoo-corp.jp

ABSTRACT

When developers operate a service, both the business objectives and users' requirements must be satisfied. However, the interest between a business strategy and an action for the users is often unclear. Moreover, users' requirements that are inferred from user data analysis may not correspond with users' real requirements. In this paper, we propose the GO-MUC method (Goal-oriented Measurement for Usability and Conflict) and apply it to Yahoo!Crowdsourcing. The GO-MUC method can develop a strategy considering requirements of both the user and the business. Our results validate this method; this method can find an interest between the business side and users side and plan more effective and user-friendly strategies to resolve a conflicting interest.

Keywords

strategy design; goal-oriented; measurement; GQM+P;

1. INTRODUCTION

Developers must know the business objectives (e.g., increasing profits and the number of users) to develop and operate a service. In addition, they must resolve usability issues. However, there are two main problems in this process. First, the relationship between a business strategy and an action for users is often unknown, though developers must satisfy requirements of both sides simultaneously. Second, users' real requirements are not always inferred from quantitative analysis. The bottom-up method has a limit when covering users' real requirements.

To resolve these problems, we propose the GO-MUC method. This method can find the influences of metrics between the user side and the business side, and plan a strategy that resolves a conflicting relation. It uses a persona and GQM+Strategies (GQM+S) to find metrics that are related to users' requirements directly. GQM+S is a goal-oriented approach to align business goals and strategies. A persona is a typical user model to help solve design problems. When we consider GQM+Persona (GQM+P) as GQM+S on the user side, GQM+P allows all users' expectations to be covered and goals to be managed. Using the same structure on the business side and user side enables both sides to be compared, which facilitates finding an interest. Now, a relation that the usability tends to worsen when a GQM+S metric improves is defined "conflict".

We formulated our study to answer the following three research questions:
RQ1: Does GQM+P produce a lot of users' questions and metrics?
RQ2: Is it possible to find an interest between different standpoints?
RQ3: Can a strategy be developed to resolve conflicting interests?

To respond to these research questions, we apply the GO-MUC method to Yahoo! Crowdsourcing. The case study is used to discuss the validity of the proposed method.

The contributions of this study are:
・The GO-MUC method facilitates finding interests between business strategy and an action for users and planning strategies to solve a conflicting interest.
・The GO-MUC method promotes user-centered system design.

The rest of the paper is organized as follows. Section 2 presents the background of our study through related work. Section 3 introduces the GO-MUC method to resolve the problems described in Section 2. Then an example of applying the GO-MUC method and its results are proposed in Sections 3 and 4, respectively. In Section 4, we also discuss effects of our approach and the proposed research questions. Finally, we describe the conclusion in Section 5.

2. BACKGROUND

2.1 GQM+Strategies

GQM+Strategies (GQM+S) is a goal-oriented approach that extends the Goal-Question-Metric (GQM) paradigm to align organization goals and strategies to achieve goals. The GQM paradigm is a framework to link measurable corporate goals, questions to evaluate achievement of the goals, and measurable metrics to answer questions [1]. The GQM approach can measure whether a business goal is achieved. Many works have focused on this method [1,2]. In previous studies, it is clear that this approach is useful because it helps justify measurement efforts.

2.2 Persona

A persona is a fictitious character that shows a typical service user. A persona should be created as if it really exists by setting following conditions: name, personality, lifestyle, and situation when using a service. In this way, a persona realizes users'

motivation to use a service and users' real actions. Then the users' requirements are demonstrated, which leads to solutions of usability problems [3]. In addition, the paper by John and Jonathan indicated that only several personas provide effective results [4].

2.3 Related Works

Many studies have evaluated usability metrics derived from source codes or specifications [5-7]. For example, Ivory et al. indicated that highly valued websites by experts can be predicted by measuring metrics from the source code [7]. However, it is inefficient to select better metrics after measuring many metrics. Moreover, metrics corresponding to users' real requirements are not actually identified because the metrics are not connected with users' conditions. It is necessary to define metrics with a top-down approach from users' actions or users' thinking because this approach results in identifying specific problems and more effective solutions.

Many authors have proposed methods to measure usability and user-oriented engineering [8-10]. On the other hand, other studies have proposed frameworks to measure business processes [11-13]. However, all these works dealt with either the usability process or the business process. Hence, their relationship and the ability to evaluate them simultaneously have yet to be elucidated.

3. GO-MUC METHOD

The GO-MUC method (Goal-oriented Measurement for Usability and Conflict) is a goal-oriented strategy design approach considering requirements of both the user and the business. Figure 1 shows the overview of the GO-MUC method.

The approach contains the following two main phases:

I. Analyzing the influences of metrics between both the user side and the business side
II. Planning a strategy for solving a conflicting relation

Additionally, we must verify the strategy and the hypothesis at last. Consequently, this method can be used to plan a strategy that influences both sides. After preparing real user data and a GQM+S graph, the GO-MUC method is applicable to any service or product. In particular, this method is especially useful when strategies must meet the demands of both users and developers.

3.1 GQM+P

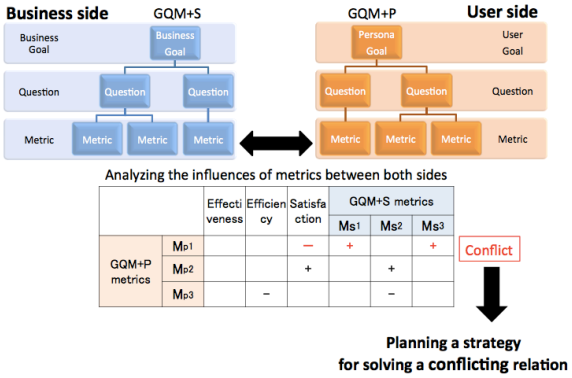

Figure 1. Overview of the GO-MUC method

GQM+P (GQM+Persona) is a framework using personas to create a GQM+S graph from the users' side. In a GQM+P graph, the goal is a user's purpose for using a service or product, while a strategy is a point of improvement as seen from a user. Moreover, an assumption is a user's requirement. Based on this approach, we can get a persona's original GQM paradigm. GQM+P differs from GQM+S in its viewpoint; GQM+S is a framework for business, whereas GQM+P is a framework for users.

3.2 I. Analyzing the influences of metrics between different sides

This section introduces how to analyze the metric interaction between the user side and the business side. This phase contains the two steps: creating GQM+P and finding the interests of metrics between both sides via a matrix. To analyze the influences of metrics between both sides, it is necessary that both the GQM+S metrics and the GQM+P metrics are prepared. Thus, First of all, create GQM+P to derive the metrics from users' viewpoint. Next, create a matrix to compare both side metrics. Finally, we can find the interests relation via the matrix.

a. Creating GQM+P

For a service or product, use the following steps to create a GQM+P graph:

(i) Create several personas, and fix the purpose for using the service for each persona.
(ii) Deduce assumptions from all goals.
(iii) Set questions and metrics to evaluate each assumption.
(iv) Plan strategies to satisfy each assumption.

In phase (i), analyze user data and fix some persona's original conditions (e.g., name, personality, time when using the service, device, and environment). In phase (ii), deduce assumptions and connect these to goals. To assess the process until users achieve their goals, assumptions are always connected in GQM+P. In phase (iii) and phase (iv), link questions, metrics, and strategies to each assumption. In this way, it is possible to derive strategies and metrics from personas and to determine subsequent actions for users.

b. Finding the interests of metrics between both sides

Table 1. Example of a matrix

		Effectiveness	Efficiency	Satisfaction	GQM+S metrics		
					Ms_1	Ms_2	Ms_3
GQM+P metrics	Mp_1	+		+		+	
	Mp_2		−		−		
	Mp_3			+			−

This section introduces a method to find the metric interaction between GQM+S and GQM+P. Measurable GQM+P metrics must be selected before creating a matrix.

The three main usability factors are effectiveness, efficiency, and satisfaction [14]. These are used to fill out the directions of the factors due to improving the GQM+P metrics. The direction "+ (plus)" shows that the GQM+P metric has a positive influence on the usability factor. On the other hand, the direction "− (minus)" shows that the GQM+P metric has a negative influence. Next, fill out the directions of the GQM+P metrics when the GQM+S metrics improve. Table 1 shows an example of a matrix. The matrix in the above subsection has an important feature; it can clarify interests regardless if the directions match. When the directions of all cells in a row correspond, the interest between a business and users coincide. Consider GQM+P metric Mp1 in Table 1. Mp1 improves when GQM+S metric Ms2

improves, and the effectiveness also improves. The relation is mutually beneficial. The relation in the case of Mp2 is the same. In contrast, GQM+P metric Mp3 has the opposite relation; that is, the usability likely worsens when developers implement a strategy that influences the metric for Mp3. Thus, this matrix is very useful because it easily visualizes problem areas.

3.3 II. Planning a strategy for resolving a conflicting relation

Develop a strategy with the matrix created in subsection 3.2. If there is a conflict, a new strategy must be implemented to resolve the problem. The following strategy can be used when a conflicting relation is identified. First, identify a metric with a conflicting relation. By focusing on the GQM+P metric, and assuming that the GQM+P metric is Mp, find a factor that becomes worse when Mp improves. This factor can be any one of the GQM+S metrics or the three usability factors. Finally, define it as X, and find another GQM+P metric Mp' that improves X. Then, the strategy is "implement a strategy that improves X".

4. CASE STUDY

We applied the GO-MUC method to Yahoo!Crowdsourcing[1].

4.1 Yahoo! Crowdsourcing

Yahoo!Crowdsourcing is a web service of Yahoo!JAPAN. In this service, orderers receive tasks on the Internet. When order receivers complete a task, they earn points as the reward. Developers have already applied GQM+S to Yahoo!Crowdsourcing to manage business goals. They defined metrics derived from GQM+S as KPI, and KPIs are shared with all the parties concerned.

4.2 I. Analyzing the influences of metrics between different sides

a. Creating GQM+P

For Yahoo!Crowdsourcing, create GQM+P using the method described in Section 3.2. After analyzing the data of 1,000 users, we developed five personas. These personas have some conditions (e.g., name, personality, scene of using the service, and use frequency). After holding a workshop involving six people, we derived goals, assumptions, questions, and metrics. This resulted in many factors (Table 2). The results of the workshop indicate that a lot of elements, including metrics, not found using the source code can be identified by GQM+P.

Table 2. Numbers of GQM+P factors

Goal	26
Assumption	38
Question	40
Metric	52

b. Finding the interests of metrics between both sides

We created the matrix to analyze the influences of metrics between the GQM+P metrics and the GQM+S metrics. Table 3 shows the matrix with some metrics of interest. The GQM+P metric "Density of people in an hour" has a conflicting relation. The metric tends to improve when the GQM+S metric "DAU" improves, but users' satisfaction tends to worsen when the GQM+P metric improves.

Table 3. Matrix for Yahoo!Crowdsourcing

					GQM+S metrics			
		Effectiveness	**Efficiency**	**Satisfaction**	Number of completed in-house tasks	Number of completed academic tasks	DAU[2]	Number of all completed tasks
GQM+P metrics	Density of people in an hour			−			+	
	Number of tasks supplied per day			+	+	+		+

4.3 II. Planning a strategy for resolving a conflicting relation

We planned a strategy using the method introduced in subsection 4.2 to resolve the conflict. It is reasonable that DAU has the largest improvement when the density of people is maximized (peak time). Thus, a strategy that improves the users' satisfaction must be implemented at the peak time. The strategy "increasing the number of tasks supplied at the peak time" may solve the problem because "Number of tasks supplied per day" improves users' satisfaction. Hence, considering that the peak time is 2:00 PM, we formulated the following hypothesis:

> *Increasing the number of tasks supplied at 2:00 PM improves users' satisfaction.*

4.4 Verifying the strategy and the hypothesis

To confirm the validity of the above hypothesis derived using the GO-MUC method, we implemented the strategy planned in subsection 4.3.

a. Experiment

By measuring NPS[3] after implementing actions for a certain number of days, we compared the score with the normal NPS. NPS is used for the digitization of users' satisfaction. We conducted the experiment twice. The difference between the two experiments is the timing of when the normal NPS is realized. In the first experiment, the normal NPS occurs two weeks before starting the experiment. On the other hand, the normal NPS occurs just before starting the experiment in the second experiment. Incidentally, the scale of the service is a few thousands users. The number of tasks at peak time is about 30 and a limit of users per task is hundreds or thousands.

b. Results

Table 4 shows NPS in the two experiments. In the first experiment, there is a clear difference between the normal NPS of P1 and the second NPS of P1; the second NPS is much higher. Although some other factors might improve NPS, the strategy also must improve it. Moreover, the second NPS of P3 improves slightly in the second experiment. The second NPS of P4 is worse than the normal NPS of P4. Considering that both the NPS of P3 and the NPS of P4 are measured simultaneously, it is reasonable that other factors decrease users' satisfaction. In this

[1] http://crowdsourcing.yahoo.co.jp/

[2] DAU (Daily Active User) is the number of users performing tasks per day.

[3] NPS (Net Promoter Score) is a metric to measure customer loyalty. All NPS values are in the range of -100..100.

case, the NPS of P3 also should worsen, but the experimental results show improvement. It seems that the strategy is more influential than the other factors. These results show that the strategy is effective anytime.

Table 4. NPS in the two experiments

Experiment	People	Normal NPS	NPS after implementation of the strategy (Second NPS)
First experiment	People who **carried out** a certain task at the peak time (P1)	-73.6	-54.74
	People who **did not carry out** a certain task at the peak time (P2)	-67.30	N/A
Second experiment	People who **carried out** a certain task at the peak time (P3)	-47.31	-46.91
	People who **did not carry out** a certain task at the peak time (P4)	-52.48	-56.00

c. Threats to validity

The NPS in Table 4 was determined by dividing the NPS acquired indiscriminately into a group of people who carried out a task and a group of people who did not carry out a task. In Figure 2, people in Groups1-3 carried out a certain task at the peak time, while those in Groups 4-6 did not. Those in Groups 1, 3, 4, and 6 answered the NPS questionnaire before starting the experiment, while those in Groups 2, 3, 5, and 6 did not answer the NPS questionnaire after implementation of the strategy. Na in Fig. 1 is the normal NPS of people of Groups 1 and 3, while Nc is the second NPS of people of Groups 2 and 3. Nb and Nd similar. Thus, it is possible that people who influence Nc and Nd do not necessarily produce the same results as those who affect Na and Nb respectively, which is a threat to validity.

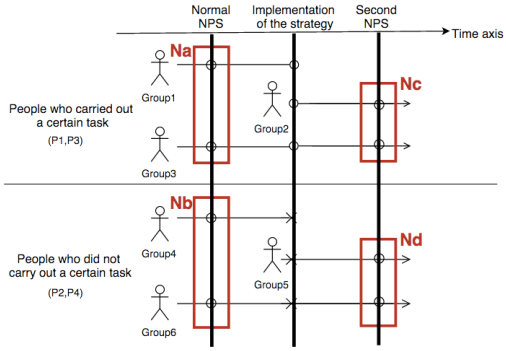

Figure 2. How NPS measurement is measured

4.5 Discussion

RQ1: Does GQM+P produce a lot of questions and metrics?

It is evident from Table 2 that many elements can be derived from GQM+P. Questions from both the business side and user side can be determined. Additionally, introducing personas into the GQM paradigm can realize elements unique to each user.

RQ2: Is it possible to find an interest between different standpoints?

Table 3 suggests that reciprocal relationships or conflicts between the business side and the user side can be elucidated from a matrix. Moreover, it is easy to discover conflicts. Thus, clues can be used to develop a plan for specific actions.

RQ3: Can a strategy be developed to resolve conflicting interests?

The relationship in subsection 4.2 shows a case of a conflict. To resolve this problem, we planned and implemented a strategy via a matrix. The experimental results validate our approach. Thus, the GO-MUC method can develop an effective strategy.

5. CONCLUSION AND FUTURE WORK

Metrics corresponding to users' real requirements are not actually identified. Furthermore, almost all previous works dealt with either the usability process or the business process, and did not evaluate the two simultaneously. Herein we propose the GO-MUC method to resolve these problems, and verify the strategy planned using this method in the plan-do-check-act (PDCA) cycle. The PDCA cycle is an interactive four-step method for carrying out change. The results show that the hypothesis is reasonable and the strategy improves usability. Hence, the GO-MUC method may be beneficial for business and user side approaches. Additionally, user-centered system design can be realized with this method because this method uses a persona.

In the future, we plan to verify the validity of the GO-MUC method for other service or product. We will also evaluate a service during the development phase. Because neither the case where a GQM+S metric worsens nor the case when a GQM+P metric improves or worsens can currently be described, we intend to consider these cases in the future. Finally, we plan to propose a way to visualize the relationship between both a business strategy and an action for users.

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