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Information Systems Improvements for Borderless Broadcasting by a Soft Systems Methodology-based approach

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Abstract

Information imbalance between communities in regions like Asia Pacific motivated this research to consider borderless broadcasting as a potential link between information technology (IT) and people in diverse communities. The key to improve the situation is seen as improvement of information systems (IS) for such a borderless broadcaster, which means offering more information that are meaningful to the communities.

This paper adopts as the main concept Soft Systems Methodology (SSM) which has been argued to benefit development of meaning-sensitive IS, while applying an SSM-based approach to improve IS for a borderless short wave radio broadcast from Japan covering regions in Asia. The focus is on how the SSM-based approach can help make borderless broadcast more meaningful, defined as being relevant, valuable, and understandable to receivers. The result of the application suggests that the SSM-based approach is beneficial to borderless broadcasting.

Key words: *information system (IS), borderless broadcasting, Soft Systems Methodology (SSM), perspective, meaningful information*

1 Introduction

From a global perspective, developments of information technology (IT) and information systems (IS) are expected to bring about both prosperity and equality of people. However, the more rapidly IT and IS progress, it seems that more people are left in wider prosperity imbalance, because many of them do not have access

to the necessary media. There is a need for measures to counter the imbalance, especially in a diverse region like Asia Pacific.

An approach is to establish a link between the information technology applications and people via *borderless broadcasting*. Borderless broadcasters can be identified as short wave broadcasters, satellite broadcasters, and also information providers on the global computer networks such as Internet. It can be said that people who are more likely to suffer from information imbalance are those groups who have access to short wave broadcasts but not satellite or computer media, as many live in isolate places and less privileged environment. Their number totals more than tens of million people.

These facts led us to take up a short wave broadcaster as our initial case to consider how a more appropriate utilization of IT and IS can be realized. Since the most important task in our view is to distribute information resources to different communities, we must be especially careful that information is meaningful to the receivers. For this cause, Soft Systems Methodology (SSM), which is known to help meaning-sensitive IS development, was selected as our approach for IS improvement.

We propose a version of IS improvement approach we used to examine a borderless short wave radio broadcaster in Japan which broadcasts to the world around the clock in 22 languages. We focused on how to improve IS for broadcast of news in English, Japanese, Vietnamese, and Thai languages. Results are reported.

2 Theoretical and methodological considerations

2.1 Consideration for borderless broadcasting problem

In order to understand the nature of borderless broadcasting, we look at its systemic qualities. As we are interested in information distribution as a resource distribution, we recognize information as the only relevant resource and examine borderless broadcasting hierarchically as follow.

- Level 0:

Borderless broadcasting is a subsystem of the global society system which has a desirable goal to achieve a more spread out distribution of information resource. This is in accordance with the S-concave preference in social evaluation which asserts that an acute imbalance of wealth, information in this case, is hazardous to both the society and its economy.[1]

Therefore, borderless broadcasting is to help increase the wealth of needy communities in the context of the global system.

- Level 1:

Borderless broadcasting is a human activity system that physically exists in a local community. As a system, it must serve the interests of the system's owner. As a subsystem of Level 0, it is desirable that it transforms information inputs into information outputs that can help increase the wealth of receiving communities. In general an increase of wealth is possible if and only if the information is relevant, valuable, and understandable to the receiving community. Such desirable information is called *meaningful information*.

- Level 2:

Ideally, a borderless broadcasting system consists of some processes that can identify the characteristics of meaningful information and convert input information to have such characteristics. However, there are several difficulties:

- Characteristics of meaningful information are difficult to be identified because they concern attributes of receiving communities which may not be known or understood in the borderless broadcasting system.
- Characteristics of meaningful information may not be realizable due to various constraints such as conflicts of interests with the borderless broadcasting system's owner.

Therefore, we must overcome the above difficulties in order to achieve improvements of borderless broadcasting.

We may say that IS improvement for borderless broadcasting is an effort to improve borderless broadcasting without changing non-information resources. A model to represent borderless broadcasting improvement will be given in Section 4.

2.2 Consideration for IS methodology

For the problem situation of borderless broadcasting, we make considerations about its nature in selecting a methodology to help improve the situation.

- Diversity of receivers

Borderless broadcasting is in a position to transmit information across the border over the world. It, however, must encounter a big obstacle concerning diversity of receivers. Therefore, an IS methodology suitable for policy stated above must be able to encompass the diversity of the global communities into consideration.

- Merits of Soft Systems Methodology

SSM, in the simplest form, can be described as an iterative methodology to learn and improve a problem situation. It is suitable for a case where the problem situation is unclear like when a borderless broadcasting cannot determine the characteristics of meaningful information.

A simple usage of SSM is illustrated in Figure 1. The target problem situation is to

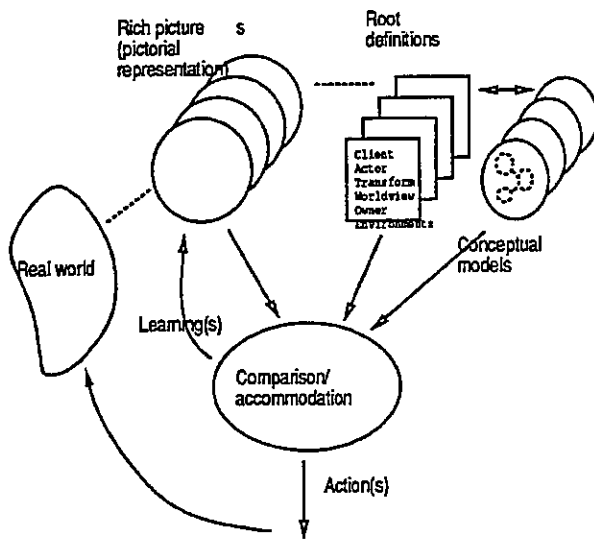


Figure 1: A simple model of SSM

be inquired by clarifying all possible perceptions about it. Descriptions of the real world are to be compared with descriptions of conceptually meaningful systems which are explained by *root definitions*, defined by the system's client(C), actor(A), transformation(T), world view(W), owner(O), and environmental constraint(E), together with corresponding *conceptual models*. The comparison and discussions will result in new learnings or an agreed action for improvement.

Since an action for improvement may result in changes in the problem situation and perceptions about it, SSM suggests that the process of improvement should be iterative in cycles of learning. It terminates only by our decision to do so.

An IS development can ensure meaningfulness by starting with consideration of underlying problem situation with root definitions and conceptual models which are built based on meaningfulness. Different definitions and models are then compared and discussed to accommodate a view of desirable IS among relevant participants. An accommodated conceptual model is to be the basis for construction of data flow diagrams (DFD) and subsequent design. [4, 12]

Through formulation of relevant root definitions and their accommodations, we have rea-

sons to believe that an SSM-based approach can overcome the difficulties of borderless broadcasting improvements mentioned in Level 2. We, thus, selected SSM to examine IS improvements of borderless broadcasting. The key to realizing meaningfulness is an emphasis in the conceptual world rather than the real world or logical/symbolic world. This will be shown in the next section.

3 An SSM-based approach for IS improvement of borderless broadcasting organization

We adopt an original SSM-based approach for IS improvement or SAIL. By IS improvement we mean making changes to existing IS without altering the non-information parts of the system. The improvement process is incremental and should be continuous rather than seeking 'one best improvement.' In this way, SAIL is fundamentally based on SSM's cycles of learning in Figure 1.

SAIL is explained in a framework which we adapted from the basis for IS analysis by Sato [10] as shown in Figure 2. Two perpendicular axes covers the stages in IS development. The top part of the vertical axis covers *what* stages or those concerned with representations or requirements. The *how* axis show the way how the representations or requirements can be realized. The horizontal axis consists of real world, logical world and extended by conceptual world where people gives interpretation to real and logical objects. SAIL emphasizes the importance of the conceptual world.

1. Knowing problem situation

Activities of SAIL begins with consideration of the real world. This is a recognition of some dissatisfactions or needs for improvement. The real world is understood in it physical forms by observations and drawing tools like a rich picture. The output state of the process, or descriptions of real world, is represented in the what-real-world region.

2. Finding out root definitions and con-

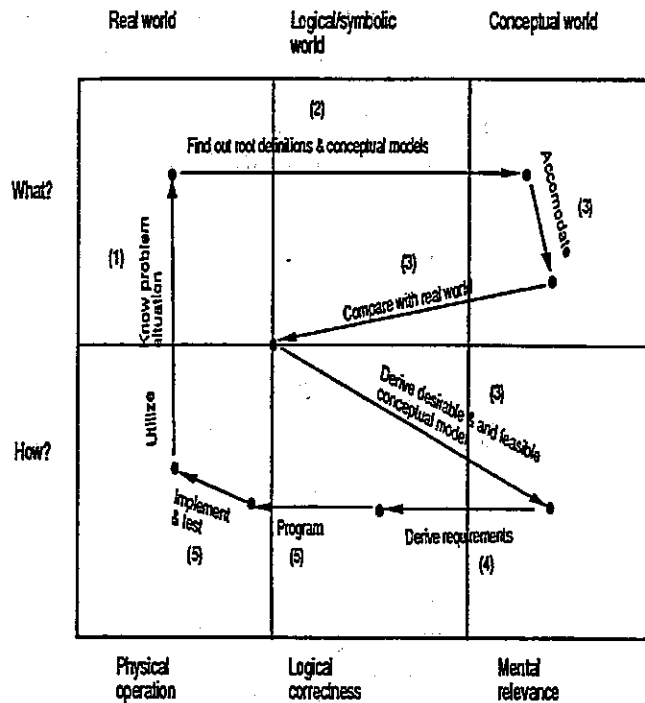


Figure 2: SAII in the framework adapted from A basis of information systems analysis and its application to prototyping, PACIS 1993 by Sato

ceptual models

Next, in order to fully grasp the meaningfulness of the situation, the second stage is to create all relevant root definitions and corresponding conceptual models. It is important to explicitly state a world view (W) or what makes a model meaningful for each representation. The second stage is a transition from real world to conceptual world. The output state, or root definitions and conceptual models, is represented in the what-conceptual-world region.

3. Learning and accommodating different models

The third stage is to create a model of desirable changes that is meaningful to all relevant sides. This is done by discussion among relevant sides with the root definitions and conceptual models as their aids. Rather than negotiation, accommodation by a third alternative is seen as desirable for achieving agreements that are meaningful to all. Then, the agreed models are to

be compared with the real world to derive desirable and feasible changes. The processes of Stage 3 therefore can be shown in three steps as a transition within the same area, a transition from agreed conceptual models to comparison with real world, and a transition from the results to a conceptual description of how to achieve desirable changes in how-conceptual-world region. In general term, this becomes a data flow diagram (DFD) which is assured to be meaningful.

4. Deriving requirements for improvements

From the accommodated conceptual model, we can define in formal terms what and how changes need to be made. These are tasks of identifying necessary data in order to realize the agreed changes as well as how to go about obtaining the data and inputting them into the IS database. In the case that changes in functions are also required, the design of new functions is to be specified here. Therefore, this Stage 4 is a transition from conceptual specifications to logical specifications which need to be complete.

5. Implementing changes

This process is just a straight forward implementation such as programming, actually obtaining new data, or installing an improved system. It is necessary, as in a general IS development, to carefully test the new system with actual users and make adjustments until they can use the new IS meaningfully as intended. This Stage 5 is a transition from logical specifications to programs and database, and later to an operational system in the real world.

Actual utilization will subsequently result in a new problem situation where new changes may be required in a new iteration starting from Stage 1 again.

4 Application of SAII to borderless broadcasting

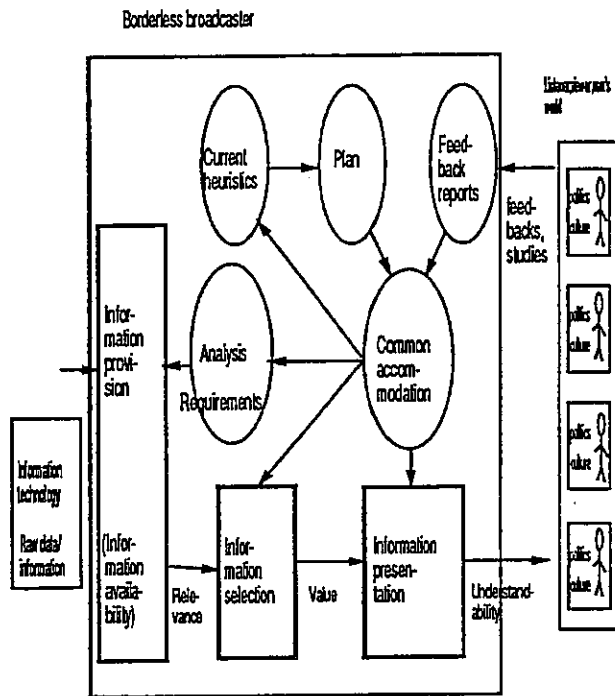


Figure 3: A model of borderless broadcasting

4.1 A general model

In order to apply SAI to borderless broadcasting, we first present a general model of information flow in borderless broadcast organization based on earlier discussions in Section 2. It is illustrated in Figure 3. We may simply consider a borderless broadcast organization to be converting raw data/information inputs into information meaningful to receivers. Here meaningfulness is defined as being relevant, valuable, and understandable as in Section 2. Inside the general model, there are three main processes:

1. Information provision
2. Information selection
3. Information presentation

The three processes cover the information flow from the initial input of raw information through increasing meaningfulness namely relevancy, value, and understandability. In borderless broadcast, information provision comes before information selection, because the information provision must support broadcasts to every region and, thus, require a vast data provi-

sion that can generate meaningful information for any receiver.

Each broadcast organization has existing ethics and plans for broadcast; this shows the interests of the system's owner and is represented by current heuristics in the figure 3. At the same time, the communities of the receivers may have diversely different sets of values, which influence how they see information as relevant, understandable, and interesting. In order to identify their set of values, studies report and feedbacks in forms of surveys or letters must be conducted.

The model represents an cyclic system of information usage and improvement, where the common accommodation process is a central comparison and accommodation mechanism. Therefore, the system of borderless broadcasting is also continuously trying to improve through accommodation of feedbacks. SSM and SAI can help borderless broadcasting achieve improvements in the most natural way.

4.2 Case background

Radio Japan serves a very diverse group of listeners around the world to present news and information about Japan, so that the people around the world can have better knowledge and understanding of Japan. This is an example of heuristics in Figure 3.

A general view of Radio Japan that is agreeable to most people is illustrated in figure 4. Radio Japan consists of two main service departments namely the General Service department which provides news and programs in English and Japanese around the clock, and the Regional Service department which provides news and programs in 20 local languages. Information is provided in the several information systems. Information selections are done by Japanese producers, while the presentations are done by presenters for each local language section.

At the time of our case study from October to December 1994, Radio Japan was looking for improvements of IS to support the most appropriate short wave broadcast.

We examined the production for the Regional Service for Thai and Vietnamese section. They represent contrasting demands for broadcast contents, since the Thai community is virtually free in media reception, while the Vietnamese

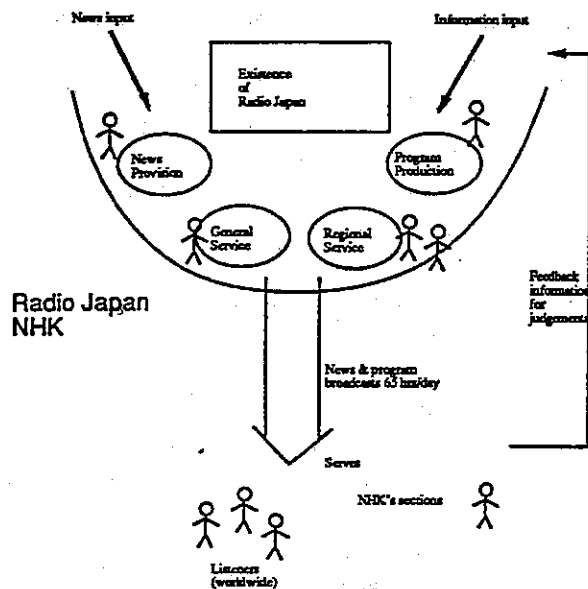


Figure 4: Rich picture of Radio Japan, NHK

communities just came out from the total government control period. These requirements are known through feedbacks in the form of letters or surveys. However, it is a fact that information from feedbacks are usually overwhelmed by plans from within the organization. This has resulted in many news and programs not being meaningful for a number of receivers as indicated in letters and feedbacks.

4.3 Important details of SAII application to the case

1. Knowing problem situation stage:

Several worrisome issues were recognized. First, there were a number of listeners who complained about programs and news. At the same time, the organization were having considerations on how to present sensitive programs related to the 50th anniversary of the end of World War II. Second, allocations of staffs to produce news programs were difficult because it was not possible to have local experts at every stage of news production. Third, it was felt that information resources of NHK were not being used effectively. These issues were examined with rich pictures.

2. Finding out root definitions and conceptual

models stage:

SAII not only considered views within the broadcast organization but also used root definitions to represent views of listeners in different communities. This was done by assessments of listeners' letters and feedbacks.

The distinctive views inside the organization were collected through interviews of members in Radio Japan namely, a department manager, an IS manager, two program directors, casters of Thai and Vietnamese language section, and staffs responsible. Here, we used a similar technique of separate interviews with high ranking management as reported in [7].

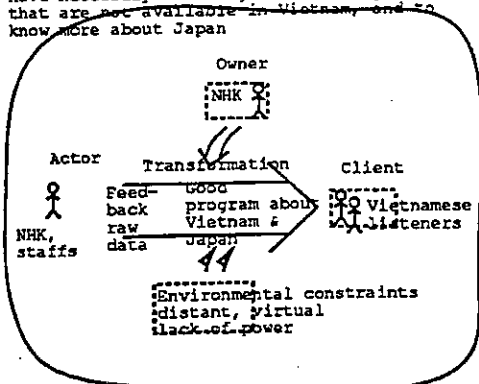
As expected, there were different views about broadcast of Radio Japan. Listeners in Thailand may see this as transformation of information and resources available in Japan to meaningful news and programs for Thailand, while the Vietnamese listeners see as a broadcast to give knowledge to people in Vietnam, where foreign knowledge is very much lacking. At the same time, the management of the organization as well as people of Japan sees the radio service as a means to help make the international community understand Japan more. Furthermore, there were differences between management that wants integrity of news broadcast and listeners that wants variety. The meaningfulness of each view is clarified by the world view (W) or the reason why such perception is desirable.

3. Learning and accommodating different models:

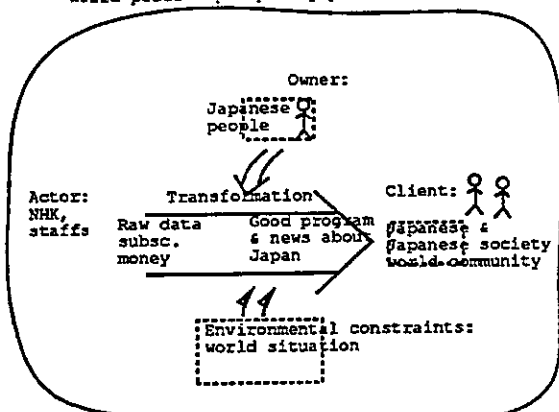
After rounds of interviews and discussions, the different views about news production for Regional Service in Radio Japan were accommodated into a new root definition at a higher systems level.

Desirable and feasible conceptual models were derived as shown in figure 6. Information to be provided were accommodated as information about Japan's contributable knowledge and all Asia-related news. For information selection, background knowledge of issues and heuristics on importance of issues are to be provided. For informa-

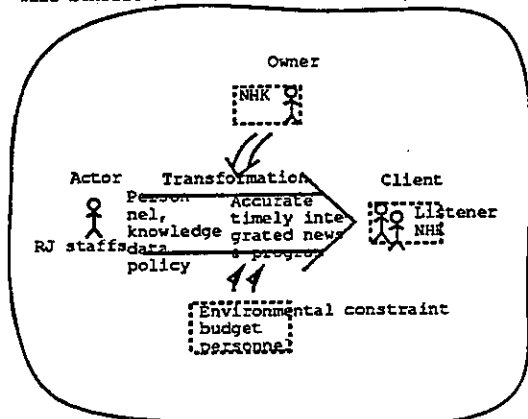
Worldview: so that Vietnamese listeners will have necessary knowledge from foreign countries that are not available in Vietnam, and to know more about Japan



Worldview: to help make people understand Japan, Japanese & Japan's views to make world peace & prosperity possible



World view: so that listeners & Japanese people will benefit and NHK have credible reputation



Worldview: so that listeners will have more knowledge about Japan in relation to Thailand

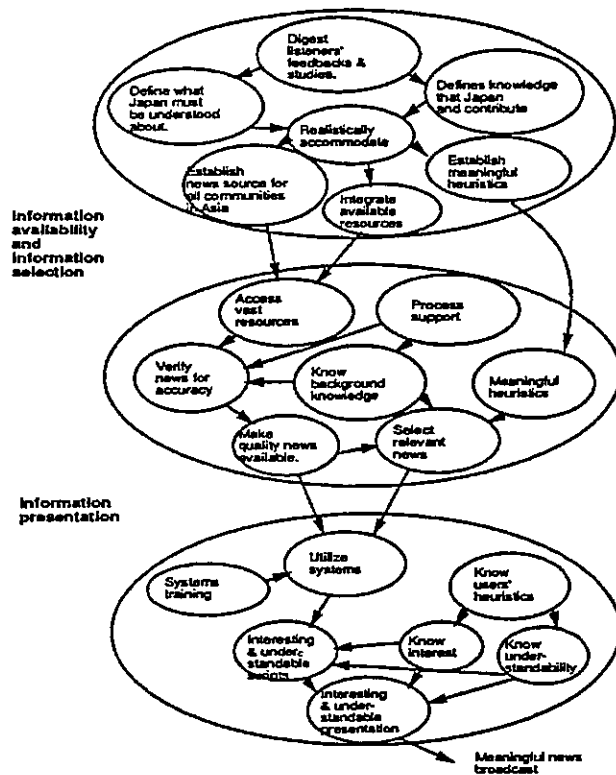
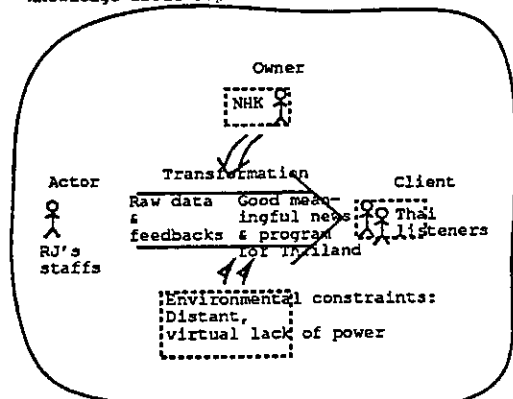


Figure 6: Conceptual models for accommodated root definition for news production and broadcast

tion presentation, it was agreed that understandability criteria be extracted from the feedbacks also.

The accommodated conceptual model became a basis for creation of meaningful data flow diagram (DFD). Each sub-activity in the model were explored in details as a conceptual model itself. Therefore, it was easy to derive the information requirements in the same manner as a DFD.

4. Deriving requirements for improvement

From the accommodated conceptual model, we derived information required for realization of each activity and sub-activity, as well as other requirements for IS improvement.

A part of suggestions for improvements are as follow:

- An integrated data base is desirable to increase news resource. Also, information sharing between broadcasters

such as NHK, BBC, kyodo should be maximized.

- Knowledge and heuristics on selecting and creating news for each community should be available on the IS, because it is impossible to have local experts at every stage of news production. This implies more effective broadcast with more efficiency.
- The IS should provide information on different subjects so as to help determine presentation techniques. For example, a world war issue for English, Thai, and Vietnam broadcasts require different tones of presentation due to cultural and historical backgrounds.

5. Implementing changes.

Implementations were commissioned to a computer systems company which implemented the system by using Apple Macintosh networks.

Our results were presented in form of reports which were reviewed by staffs of Radio Japan in terms of suggestive quality as well as feasibility in Radio Japan's culture, management, and operation.

The report received a favorable review especially on the new suggestions not brought up by the technology company.

4.4 Evaluation and utilization

The results of our SSM-based analyses were presented to Radio Japan and received a favorable review. It was seen to be suggestive in addition to a bigger IS development plan by the whole organization which was commissioned to a computer systems company.

Utilizations of the new systems were possible since May 1995. There has not been a formal evaluation as many features are not yet complete. Informal assessments are as follow.

- A new integrated database of English-based issues greatly improve the information provision. However, information about local expertise are still in the process of inputing into the system.

- Knowledge and heuristics on selecting and creating news for each community are input into local terminals in document files which can be accessed from other terminal in Radio Japan and NHK. The problem is that even with user-friendly user interface like that of Apple Macintosh, only a part of relevant people are willing to use the system.
- Knowledge concerning information selection and presentation are being used rather satisfactorily at local levels, such as within a language section, where people freely input their own data.
- Response from the listeners in general has been positive, but it is not yet related to the IS improvements.

5 Learnings

5.1 Learning about IS improvements for borderless broadcast

- Borderless broadcasting, if it implements a feedback and comparison mechanism, distinctively resembles an SSM cycle of learning and improvement. Therefore, techniques of SSM could be incorporated in the most natural way.
- Information flow for borderless broadcasting is generally represented by three stages:
 1. Information provision
 2. Information selection
 3. Information presentation

Our SSM project confirmed this model as participants agreed that this flow is meaningful to them when viewing at any level.

- The sources of meaningfulness are the various perceptions of the organization, users, and also the broadcast receivers in different communities.

In order to incorporate the meaningfulness into the IS improvement and usage, an SSM-based approach using root definitions and conceptual models techniques has been

found to be useful. The three aspects of meaningfulness can be related to a root definition as follow.

- Relevance: the information must be relatable to receivers.
→ consider from world view and translation in root definition.
 - Value: the information must be of value to receivers.
→ consider from world view and supporting details.
 - Understandability: the information's content and presentation must be understandable to receivers.
→ consider from constraints in root definition and other background knowledge.
- The knowledge about what and how information should be used in a borderless broadcasting is refined through cycles of learnings. A computerized IS helps by supporting a shared provision of information as well documented heuristics about meaningfulness criteria. The computerized IS also goes through cycles of continuous improvements based on the discussion and accommodation results.

5.2 Learning about the SSM-based approach to IS improvement

- SSM-based approach was useful in identifying meaningfulness of information for borderless broadcasting, as well as incorporating them into the IS improvement.

This is a confirmation of the benefit of SSM.

- Participation in SSM methodology of far away listeners were possible through extraction of feedbacks and studies as external participation.

As far as we know, this is a new application of SSM techniques. In usual utilization of SSM, number of participations is limited due to the necessity to participate face-to-face. However, in our research case the 'indirect participants' are in far away communities and are in great number.

- SSM was satisfactory when applied to a multi-cultural situation in the case.

6 Concluding remarks

The most important aspect in IT utilization for borderless broadcasting can be confirmed as how to incorporate meaningfulness of information appropriate to each community into the information provision, selection, and presentation. The SSM-based approach favorably used SSM modeling techniques to represent the views of each community en route to the improvement of the IS.

Development of IT in the Asia Pacific region will likely to continue riding on communication boom. Considering the diversity of the region, researches that can relate effectiveness of information businesses to factors in each community are essential. For this cause, the soft methodologies and SSM still hold attractive potentials to be explored.

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