# Individuals-Diversity-Oriented Information System Design (1) : Basic Consideration on Information System Design at University

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*Abstract* — **As to information system, "if you build it, they will come" does not work. Its result is wasting money. But, in reality, it is being repeated. This manner is deeply rooted in such a culture as bureaucracy, or such a way of looking at people as mechanical/lifeless "filling". The point of the problem is that the methodology of design is seriously lacked there.**

**In this monograph, the method of information system design is considered from the standpoint of "individuals-diversity-oriented information system design". The reasons of "individuals-diversity-oriented" are : (1) the key point of system design is understanding (both probable and improbable) user experience, with scoping diversity of individuals, and (2) the university, our workplace, is very special as an organization in the sense that it is a place where the potentialities of diversity of individuals are inquired and their promotion is pursued.**

## 1. Introduction

We know well that the stance of "if you build it, they will come" does not work, at least as to information system. But, in reality, it is being repeated. There huge money is wasted. Why does it happen? It is deeply rooted in such a culture as bureaucracy, or such a way of looking at people as mechanical/lifeless "filling". Thus, in order that we break with wasting money for useless/needless information system, a fundamental tradition-shift is required. I think the methodology is what is most lacked.

From this viewpoint, I consider, in this monograph, the method of information system design. The key point of system design is understanding (both probable and improbable) user experience, with scoping diversity of individuals. And here is an important issue to be remarked - "speciality of the university as an organization". University is a place where the potentialities of diversity of individuals are inquired and their promotion is pursued.

Thus, I inquire into information system design from the standpoint of "individuals-diversity-oriented information system design". In this monograph, I consider basic concepts which constitute the methodology of design. And this consideration is to be followed by construction and development of a model system, which will be reported, as "Individuals-Diversity-Oriented Information System Design (2)", in the next issue of this bulletin.

The monograph is structured of (1) consideration on basic concepts concerning information system design [§§2, 3, 4, 5, 6], and (2) discussion on the method of information system design [§7].

## 2. Ends of information system

### 2.1 Organizational = personal development

In general, the organization development is primarily for the members' development. Otherwize, in what sense can we say "development" about organization ? If we seems to be working for the sake of organization, the organization surely malworking. We must start correcting the manner organization functions.

The culture is made of individual's will/awareness/attitude and organizational tradition/standard/policy. They intensify to each other. When it becomes required to shift the culture, the shift must be done at the both sides of individuals and organizational tradition.

Thus, introducing an information system requires, if not members' support and cooperation, definite meaning toward members. The condition that members are ought to be demanded their support and cooperation is that the information system is for organizational = personal development. Members' disapproval/not-cooperative is reasonable if the information system is not concord with members' personal development.

The information system designer must see the larger picture in order to vision an effective system. One of the prime picture is of constituents' personal development. What is the goal of this personal development? I say it is a "well-being" — the meaning of "well-being" varies individual by individual. Here, our priority is the quality of 'personal development', not the convenience about cost or spec of the system.

The fundamental challenge for organizational information system is to contribute to the invention and design of cultures in which staff can express themselves and engage in person-

ally meaningful activities. In this sense, any organizational information system is based on making members' information communication easy, quality and effective (enlargement of members' power for information communication).

In reality, it is common for us to do a job without thinking of its true meaning, or the true reason why we must do it. It is easy for us to accustom ourselves to working for the 'apparent' organization development. We rarely stop to ask : "What is this 'apparent' organization development, for us and the organization itself?". Thus, critics point that 'urgent' and 'important' are different. Or, the difference between 'short-sighted' and 'far-sighted' is emphasized.

The information system designer considers the meaning of a system from the standpoint of "organization development for personal development". S/he takes precautions against using such words as "effective" or "efficient" without reflecting their essential meaning in a given situation. S/he stops to ask : "What is this organization development for ? What is my working as a information system designer for?"

The contribution of information system to the organization = personal development is basically of the following scheme : The information system helps us at (1) quality production and (2) improvement of our experience, by bringing us in (3) efficiency.

### 2.2 Quality production

If we have a good/enough seeds, the information system becomes a key equipment for quality production. - "If we have a good/enough seeds" is critical. The information system is not such a magic as generates quality from 'nothing'.

### 2.3 Improvement of user experience

The content of "success" of an information system is good/positive experiences of targeted users. Ends of system design are some types of user experience. In this sense, 'personal' dimension is more important than the technological.

Thus, for a system installation, the system designer give a first priority to looking for value at the individual level, instead of attempting to demonstrate organization-wide value.
The key issue for designer is to notice/consider/understand 'personal' dimension.

The term "user experience" refers to a stance that places the end-user at the focal point of design in general, in particular information system design. It stands on the regret that "if we build it, they will come"-approach does not work.

The concept of "user experience" is near to "user-centered". But, here "user-centered" should be understood in this way : User's needs/preference is not what is present now but is on the way of development toward a future - the designer contributes this development. Here the difficulty is to find an appropriate place between opposite poles of "pandering to popular tastes" and "designer's self-satisfaction". Indeed, the designers (diverse themselves about fields, such as developer, usability professional, designer, information architect) have their personal preferences (subjectivity) for types of user experience.

User experience is discribed/analyzed in terms of (1) user's trait (needs, motivation, inclination, capacity, resilience, etc.), (2) user's action/performance over the system (job content, quality of work life, etc.), and (3) user's satisfaction (job satisfaction, etc.). And as the "user experience"-concerned characteristics of the information communication system (particularly the web-based one), we may use the followings and suchlike : (1) usability (about operation), (2) functionality, (3) contents.

### 2.4 Efficiency

The information system helps us to make a development in some sense, by bringing us in 'efficiency'. - Here I use the word "efficiency" to mean "increase of cost(/labor/time) v.s. effect(/benefit) ratio". That a job-performance is efficient means that it is cost-effective. In this sense, information system makes us more efficient at our jobs.

Efficiency (increase in cost/labor/time savings at information communication situations) is brought in such contrivances as : knowledge shared, communication standardized, job automation, elimination of duplicated efforts, transforming printed matters to digital documents (farewell to piles of printed matters), shift the burden of data entry from a personnel to the end user, etc.

"Information-based organization" is the image of "efficient" organization. The ideal is that technology, by simplifying a particular task or set of tasks, makes life easier. (The reality is not like this. "Easy life" a technology has once brought changes into a new phase of competitive life.)

## 3. Speciality of university as organization

### 3.1 Creation of culture/world

When we consider the design of information system at university, it is required to think of the speciality of university as organization.

The prime role of university is the creation of culture, which includes, for example, showing possible ways of presence of world by demonstrating theoretical implications. - The university is more than an organization of education service. University [faculty] should be thought different from company [business person].

### 3.2 Diversity-oriented

The organization is for its constituents. Especially, the organization development is for the personal development of the members. This is a definite principle of organization. And this principle must be accomplished at university organization.

The staff of university acknowledge their own role and personal progess/development according to the concept of university: the prime role of university is the creation of culture. In

the case of university, those who share this acknowledgement are the subjects where "personal development of members" is considered.

University should stand as a place where creation happens. And something new is plausible to happen among diverse individuals rather than homogeneous solidarity. Thus, diversity of individuals is respected at university. This spirit is at the base of the organizational culture of university. Thus, at university, individuals are given autonomy in the development of their expertise. Accordingly, the meaning of 'usability of information system' should be somewhat different at university from company.

It is said that "in organization, it is consistency that must be the key driving factor, rather than innovation". Here consistency is regarded as a condition of usability. And bureaucracy jumps on this bandwagon: "ensuring consistency". But, consistency is basically for routine works. And It is advocated to focus on doing things in a format that can "easily/quickly" be used by staff. But, in fact, "easily/quickly" is barely attained under some small scope of working styles.

In the case of university, what we should consider is the dependency of 'consistency' on individual. We are to put diversity before consistency. And here, such words as "free format", "loose guideline" would be the key words.

In reality, the information system designer determines the critical areas that must look and work the same. It is the area where conformity should be promoted and enforced. But in all other areas, faculties should be allowed or encouraged to do their own (unique/original) thing.

### 3.3 Loose organization

University is notorious for being loosely/poorly organized compared with business corporation.
Let us see how loose/poor organization at university is criticized (cited from http://www.gerrymcgovern.com/nt/2004/nt_2004_09_20_university_websites_less_is_more.htm) :

- What is an organization if it is not organized? "A university."
- Many university websites are poorly organized, and filled with out-of-date content that has been directly published from print.
- Delivering a better service to students and staff faces challenges because of decentralized management structures and concepts such as academic freedom.
- Many universities are more like loose associations than coherent organizations.
- Often, staff give more loyalty to a particular school or department than to the overall university.
- There can also be a strong rivalry between the university administration and the lecturing staff, with the lecturers and professors keen to protect their academic freedom.
- The result is that there are multiple websites for any one university, many taking a very different approach to design.
- Out-of-date, poorly written content is rife because there are no standards, no measures, and few staff resources.
- Much of the Web is beginning to move towards standard layout and design because that's what people want. People like a navigation that is familiar, they like to know that the "Home" link will be in the same position on every page they visit. People like content that is well written, up-to-date, and accurate. Universities, on the other hand, are growing websites like mushrooms, and have an amazing capacity to publish large quantities of irrelevant and confusing content.

But, I remark that the same criticism can be read as favorable comment. Every gain is paired with loss. Each of 'same approach', 'standardization', 'coherency', 'usability', 'up-to-date', etc. accompanies its own loss, from the viewpoint of culture. Indeed, here I dare to insist that being loosely/poorly organized is what university is required, because of its organizational special role/position/meaning - that is, creation of culture.

## 4. Diversity of individuals

### 4.1 Diversity of individuals

The organization is supported by the diversity of individuals. The diversity of individuals is a condition for the organization to be alive. Indeed, what drives the organization to develop is its constituents' diversity. Diversity of individuals is the state the organization functions well. If the diversity seems to be constrained in the organization, the organization is surely going wrong direction.

The "diversity of individuals" is an old subject for the philosophy. Indeed, it is the dogma of the philosophical pragmatism and the premise of democracy (the political stance based on the pragmatism). Their standpoint is : "diversity of individuals" is definitely present before everything. And I would like to go further saying that "continually driven to become diverse" is the meaning of "life" (in contrast to "still").

Thus, naturally, system designer encounters the confrontation of different skewness of individuals. The designer should respect this diversity, thinking that each skewness has a reason. System design is of diverse-user-experience-based.

And, the skewness of designer her/him-self is also the prime key issue s/he should consider. The designer has her/his own perceptions of how 'good' or 'bad' a system is, which is skewed by her/his personal backgrounds and specialties within given fields.

### 4.2 Issue of 'usability' in regard to diversity

'Usability' is referred mainly with respect to user interface of information system, for example, design of Web site. It is defined in ISO 9241 (http://www.iso.org/) as follows :

*" Usability is a measure of the effectiveness, efficiency*

*and satisfaction with which specified users can achieve specified goals in a particular environment."*

In fact, 'usability' concerns to all of information type, information design, user interface design and diversity of individuals.

The point is that human factors must be considered from both sides of common features and diversity. For example, "hesitant users (contrasted to frequent users)" is a problem to be approached in this way. - Distinction between can't and won't becomes essential.

The inquiry of usability takes course of (1) reducing personnel requirements and (2) reducing training requirements.

Remark : Users considered in the subject of 'usability' include contents creators. As to contents creators, the design guideline becomes issue in such a way as if they will not follow guidelines, chaotic collections of documents result which cannot be accessed/navigated.

## 5. Tuning organization culture toward information

### 5.1 Diversity-oriented

As to university, every member acknowledge diversity of individuals. But practically, they do not think it important. The reason/meaning of diversity of individuals must be acknowledged once again and shared definitely. The key issue is to distinguish 'diversity' from 'right/wrong', 'advanced/retarded'.

### 5.2 Break off conservative tradition

Organizational conservative tradition is one of the major obstructions for information system designers to proceed information initiatives.

There are two types of conservative factors - those of organization management, that is, bureaucracy, and those of members.

(1) Conservative factors at organization management (bureaucracy)

Organizational conservative tradition may be expressed as "low risk", "in a row", "conformity to rules" - to sum up "safety first". In bureaucracy, they are inclined to keep current way of doing things, keep doing what every else does, for the sake of safety. Thus, for example, security policy or resource-saving policy they are willing to make tends to conflict with challenging initiatives in organization.

They prefer their own job being certainly end up to kindly considering staff's capacity/schedule. Thus, they force fellow staff to incessantly make cumbersome documents.

(2) Conservative factors at organization members.

Information-shift forces organization staff to become cooperative. If they are inclined to do as before, they are meant conservative obstruction. Being uncooperative includes : escaping from role taking (especially, role of leading members), indifference in (thinking little of) rules/formats/manners to obey, escaping from self training/skill-up, relying on other people for support/help, and so on.

So the issue in this case is evoking incentive. People is glad to accept responsibility if they believe/find it would benefit them. They take control of managing information on their own if they understand it brings cost/time/labor-saving. And in the case of university, most staff have incentive to work with the information system because working on information is of their working style.

### 5.3 Shift of paper-document-based

The core of organizational tradition-shift/switch (including members' spirits-shift) as to information is the shift of paper-documents-based. Here the problem is : content makers (esp. clerks) do not inclined to be digital content maker, but to stay in old style of job. And added are such clerical stances as "follow their choice (digital and paper)", "wait for their self reliant skillup (about digital)", But, if only 'free from documents pile (wasteful copies)' is realized, then staff are happy.

Where to begin? Begin with "information circulation" - dumping digital documents into server, assemble information/contents from multiple, disparate sources, accumulate/pile digital matters, and so on. Don't try to be smart at the start. Put assemble documents before unite them.

### 5.4 Sufficient preparation - Break off "If we build it, they will come."

"If we build it, they will come" is still a common sight at information system initiatives in organization. Though most information systems are vastly money-eating, persons in charge take this risky "if-then" without a well-thought-out plan based on sufficient investigation, simulation and test. Of course, they believe that they made a "well-thought-out plan". But the result shows it was not the case.

"If we build it, they will come" is another typical tradition, alongside of conservative tradition. Is there any reason in this tradition? Yes there is. In the case of Japanese national universities, policy about infrastructure was top-down, that is, it came from the Government (Ministry of Education). The job of a university was to spend up the assigned money by the end of the fiscal year. There was made up such a behavior pattern as : traders propose products and the university buy them - because it is the way the bureaucracy of the university felt convenient and easy. And it, as a matter of course, resulted in huge money-wasting.

The way of reforming this tradition is simple. It is just to do what lacks there, that is sufficient investigation, simulation and test. Indeed, "omitting thinking of real people" would be the foremost implication of "if we build it, they will come." There people are looked at as mechanical/lifeless "filling". And also a standardization of people is contrived there, - contrary to the stance of "diversity of individuals".

## 6. WEB-BASED INFORMATION COMMUNICATION

### 6.1 Reasons of Web-based

The Web is displacing traditional sources of information and interaction. It transfers historically paper-based tasks to online applications. Information sharing over the Web is universal in the sense that receiver need not bother with file types, end machine types, and application preparation at receiver's side. Indeed, information/knowledge sharing is the main usage of web-documents. The strong point of web contents is that they are (1) freely updated as required, (2) qualified by means of web-multimedia technology.

"Web-based information communication" is like "preparing a book". Here "prepare" means "wait". If we want a book functions, we need announce its presence. It is the reason why e-mail remains an indispensable communication media - e-mail is of prompt ('push') type of communication. We use e-mail to announce that some web-based information is prepared at some place.

Thus it is important to realize nice combination of e-mail ('push'-media) and web-page ('wait'-media). In the case of organizational mail, the following style of message will be most common:

1. Announce an event or new information.
2. Show the URLs of the webpages where details are put.
   (Some case, with temporary user id/password.)
3. Prompt the access to the webpages.

The Web automates routine inquires. Benefits are brought to both the organization (cut down on support personnel) and users (control and verify the data being entered). And server side coding plus database-driven brings out such contrivances as interactivity and user adaptive page generation.

### 6.2 Adaptive Web site

'Adaptive Web site', particularly, 'personalized website', is a requisite contrivance at university course site. (Note: Personalization site fails if it is at discretion of such users as don't have a compelling reason to personalize.)

"Adaptive" means "customize content and interface to each user individually". - Cf. In the case of traditional, "static" Web sites, the way to target diverse users is aiming at generalized types of user (but what follows the generalization is that each individual does not quite fit to the site).

The main technology which brings in "adaptive Web site" is server-side coding with database driven.

### 6.3 Users portal

The points of user portal are (1) single point of access and (2) personalized user experience. Portal is 'convenient' for users, and 'requisite' for the site administrator/manager.

For a user, the portal is the starting point (gateway, or root menu) of information and services adapted to her/him, and the point where s/he can overview the personal site map. It brings her/him in efficient environment for job performance. For example, reducing the need to move around is an effect of this architecture.

For the site administrator/manager, the portal is an architecture of personalization equipped with user authentication (control of access permission).

Common user interface may provide consistency and unified user experience. On the other hand, it is common that at personalized web site users are allowed to customize. Thus the design of user portal stands on a balance between unified environment and diversity of individuals.

### 6.4 User access authentication

In the case of organizational web-based information communication, the user access authentication system becomes required.

Setting the access authentication is very easy, in fact. But management is troublesome, if not difficult. Thus, design of access user categories is very important. (Once the categories are fixed and the authentication system is started, it is difficult to change them.)

In particular, the balance between the minuteness of setting user authentication and workload of architecture creation by administrator becomes an issue, too. The point to be examined is the actual effect of their time-consuming jobs.

### 6.5 Server side coding, database driven

Adaptive/personalized website use database applications with Web interfaces equipped. It is constructed as "database driven Website using server-side coding".

Database driven Website becomes common, benefiting from PHP (a server-side scripting language), PostgreSQL (a relational database management system) and suchlike open source softwares. (SQL, Structured Query Language, means the standard language for interacting with relational databases.)

Indeed, this technique is requisite in maintenance of a content-driven site where constantly updated contents are managed. The point is : achieving complete separation between frame design (site design) and the contents so that one can work with each without disturbing the other.

As an application, one can create a content management system targeting those writers who are untrained in HTML, file system of the Web server and FTP. It allows the writers to post contents themselves. commonly use Web interfaces.

### 6.6 Content authors

Content authors are one of the most important, if not the most important, contributors to the usefulness of organization information system.

In order to help content authors, a sort of systems called content management systems (CMS) is developed/produced. But

it does not seem to become a solution. It entails an antinomic problem of balancing between functions and usability.

Indeed, CMS is usually made functionally-full-equipped and, therefore, becomes cumbersome to use. Content authors would battle with CMS. It results in a shift of focus from creating content to learning how to master the CMS.

I insist that it is better for content authors to start mastering basic skills of Web contents making/management, acknowledging them as requisite media literacy.

## 7. Method of information system design

### 7.1 Standpoint : Organizational = personal development, diversity-oriented

I insist that 'organizational=personal development' and 'diversity-oriented' previously discussed are prerequisites as to the stance of information system design at the university.

The design of information system satisfying this prerequisites depends on case (usage, aim/goal, user, contents, etc.). But still the point is to realize, at design and implementation, the 'autonomy' of users, in such form as staff self-service. It includes enabling individuals to take control of their work-related information, which a sort of self-service web applications would put into .

'Diversity' is not necessarily about personal traits. It includes diversity of situations where each individual is placed, or conditions which each individual is inclined to choose. In this case, the subjects of 'self-service systems' is such as flexibility enough to encompass a wide variety of access channels and delivery modes (e.g., types of PC, OS, Web-browser).

### 7.2 Determining user-experience-as-goal

Thinking-actually helps the designer to avoid "if we build it they will come" mistake.

The goal of an installation of information system must be considered/determined in the form of user experience. That is, who use, why they use, where they use, how they use, how they benefit from the system, and so on. Being easy, necessary, favorable, profitable to use are examined by this stance.

And according to this sense, the designer must consider actual people as 'users', avoiding to regard/treat people as labor (how much) or functions (what). The designer simulates whether 'that person' would use the system (and how). S/he counts who and who would use it (and how), who would be uncomfortable working on the system, etc. If it seems that intended users don' t come and therefore the system does not pay off, the designer stops launching the system.

In order that the designer reaches defining a clear and meaningful set of user experiences, first, s/he must understand targeted individual users. Thus, s/he practice :

- minute investigation into people's actual tasks and potential need/want/requirement
- distinction between need and want
- distinction between what's required and what's desired
- understanding that one person's necessity is another's extravagance, etc.

In parallel, s/he tries to identify tasks that can potentially be completed using the system, determining the needs that the system could address.

### 7.3 System preferences/condition/requirement

By understanding expected user experience, the designer then enters the phase of determining the ends/preferences/teritory/target of system. It is a trade-off process among requirement satisfaction, users' abilities and cost.

What I regard as the primary/basic conditions about information system are the followings:

- Multi-vender environment
- Organization website for information/knowledge-sharing
  - One-stop-shop style
  - User's portal
- Seamless file flow in the form of email-attachment or over the web

We may use (1) usability (about operation), (2) functionality, (3) contents and suchlike as the "user experience"-concerned characteristics of the information communication system (particularly the web-based one).

### 7.4 Starting small, making the system pay off

It often takes place that university introduce expensive but useless systems. They naively have a big vision of an information system as a huge capacity to accept all the initiatives. The points of this failure are :

- The person in charge omits thinking what people really need, and take a "if we build it, people will come" approach.
- The big system is hard for people to go through it all to find exactly what they need and can do. Too many functions which people rarely use hinder the user to have perspective.
- The person in charge cannot afford to consider user experience because s/he tries to tackle too much in one fell swoop.

Thus, the solution is :

1. Start with small initiatives by splitting a big project into phases, which gives us more control over the outcome and quickly demonstrate value. And it also means splitting a high risk into low risks. (A small-scale failure won't doom entire effort.)
2. On those successes, one layer at a time, gradually build the desired system.

By starting small, we can make the system pay off.

### 7.5 Minute planning, desktop simulation, test

All too often, projects start before thought has been put into

the project's purpose, its desired results, and ways of evaluation.

How is the case of university? Until quite recently, national universities tended to be very loose at using money. This tendency was driven by the fact that money was not what they earned, but what automatically flowed in to them. In the worst, money might be expensed just for the sake of expense.

Though national university changed its status to "corporation", they seem difficult to bid farewell bureaucratic tradition which sink deeply in their body. They are not accustomed yet to take the standpoint of "user experience" and to do fine/strict/minute/thorough preparation (thinking before acting, clearly stating the objective of the project and defines its scope - clarifying what the project does and does not cover, planning, desktop-simulating and testing).

Besides this, they tends to plan huge initiative, while setting a deadline at a short distance. Thus, as a matter of course, planning, desktop simulation and test become perfunctory. This result is : they buy the useless, or they fail to make their initiative (which is exorbitant at scale !) included in the budget.

This serves as an example of how not to behave. What must be done for realizing a system which pay off is : (1) taking a "user experience"-based stance, (2) doing minute preparation, and (3) starting small.

### 7.6 Instruction of system literacy

What completes the installation of an information system is the staff induction with staff training. The system designer must be a good trainer. There are many knacks of instruction which benefit her/him. A&Q contrivances, such as IT help desk, might be required.

What is mostly instructed is : what/how is "effective use" of the system, that is, the meaning of the system (in contrast to operation manual). Indeed, users must learn what enables them to work with some types of information.

### 7.7 Evaluation of the system

The system, or the design of system, should be evaluated. When we make "evaluation" a subject, we enter the research field of "value engineering".

We consider as follows and each depends on cases : what is appropriate to be made an item of evaluation, what the criteria of each item is, how each item is evaluated (measured), how the facets of user experience are illustrated in diagram, etc.

In the case of Web-based information communication system, the followings and suchlike are typically used as indices : 'efficiency/effectiveness/productivity', 'usability (easy to use/operate)', 'functionality', 'content', 'user satisfaction'.

## 8. Conclusion

Designing and installing an information system is a challenge. It easily fails if we omit thinking before acting.

Everyone knows that thinking must be put before acting. But s/he fails in practice. The reason why it happens is that they miss the content of thinking. Specifically, the methodology of information system design is lacking.

The most important components of this methodology are the understandings of the followings : (1) ends of information system expressed by the words of "user experience", (2) speciality of the organization, (3) meaning/situation of diversity of individuals, (4) culture/tradition of the organization, (5) advantageous features of the system.

As to (4) culture/tradition of the organization, the following shift becomes required : diversity-oriented, break off conservative tradition, paper-document-based, "if we build it, they will come."

The points of practice are "minute thinking", "starting small, making it pay off", and user support (induction, training), setting aside other matters of course.