Augmenting Usability: Cultural elicitation in HCI

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Abstract. This paper offers context and culture elicitation in an inter-cultural and multi-disciplinary setting of ICT design. Localised usability evaluation (LUE) is augmented with a socio-technical evaluation tool (STEM) as a methodological approach to expose and address issues in a collaborative ICT design within the Village e-Science for Life (VeSeL) project in rural Kenya. The paper argues that designers need to locally identify context and culture in situ and further explicate their implications through the design process and at the global level. Stakeholders' context, culture, decisions, agendas, expectations, disciplines and requirements need to be locally identified and globally evaluated to ensure a fit for purpose solution.

Keywords: Context and culture, usability evaluation, socio-technical evaluation, DUCE, STEM, face negotiation theory, inter-cultural, multi-disciplines

1 Introduction

Many techniques and frameworks offer different approaches to eliciting culture and context in Information and Communication Technologies (ICT) design [9, 10, 26]. These approaches have the merit of viably exploring elements of the problem domain within the complexity of collaborative design settings. However, making visible and integrating the cultural gaps between designers and users and translating these into socio-technical implications for design decisions at different stages of systems development still remain a challenge.

If not iteratively evaluated across cultures, contexts and disciplines, a technology, a decision or an action in a local context or within a stage may result in profound implications for later stages or in the global context, thus affecting technology acceptance, usability and adoption.

While socio-technical systems theory has been credited for identifying relevant social dimensions that should be considered in technology development, this theoretical framework has yet to offer a methodology or grounded approach usable by interaction designers [7]. Conversely, usability engineering benefits from many validated evaluation methodologies and frameworks but these fail to effectively encompass the socio-technical issues involved in designing for culturally different users in multidisciplinary teams.

The impact of culture and context in technology design is well documented [1, 10, 15, 25]. Nonetheless, it is demonstrated in this paper that those issues are better exposed and richer when methodologies are localised and combined rather than doing one-off elicitation. This paper, therefore, offers localised usability evaluation combined with socio-technical evaluation in the context of an ongoing Village eScience for Life (VeSeL) project.

A background of the study along with a description of the two approaches and how they have been combined are presented. An outcome of the study highlighting its merits and limitations is also presented.

2 VeSeL: Background and Approach to Design

The VeSeL project, part of the Bridging the Global Digital Divide (BGDD1) network funded by the EPSRC2 in the UK, is an ICT research project for development that aims to enable rural communities in Kenya, Africa to use digital technology to improve their agricultural practices and literacy levels. VeSeL is a multi-disciplinary project involving five UK universities plus the University of Nairobi in Kenya, with specialists in education, HCI, power engineering, computing, communication technologies and agriculture.

Two rural communities (Kiangwaci and Kambu) had been previously identified by the University of Nairobi. These are both rural agricultural communities, but with vastly different economic and climatic conditions. The choice was made to work with both communities in order to facilitate comparisons across two very different sites, and in case the relationship with one community broke down.

Farming communities in Kenya tend to organise themselves into small self-help groups based on mutual interests (growing the same crops or herding similar livestock). This enables them to share experiences and form selling and buying power groups. The team therefore identified a self-help group in each community and a local primary school as direct target users for the research. The next step for VeSeL was an inquiry into the contexts and cultures of the user groups to elicit their ICT requirements; identify a suitable approach to propose and design a fit for purpose system.

The interaction between technology and its users has a profound and influential impact on both in that users influence technology as much as technology influences users [3, 27]. Thus, the VeSeL approach to context and culture of the rural communities had to be participative and inclusive of the social and technological context of its stakeholders (users, designers, government, institutions and third parties). Two complementary approaches were adopted: Localised Usability Evaluation (LUE) and Socio-Technical Evaluation (STE). Both of these approaches aimed for an ethnographic understanding and effective design rationale.

LUE in VeSeL is an important strand because the yet-to-be-developed-technology needs to be evaluated before being deployed to the farming communities. This is particularly true because users (rural African farming communities) and designers

[1]BGDD: http://www.bgdd.org
[2] EPSRC: http://www.epsrc.ac.uk

(Western) of the technology have different cultures, technology expertise and usage backgrounds. While it is important to identify the context and culture of the users (LUE), explicating the different assumptions of producers and users in the process of design and the inherent implications is a complementary perspective needed to effectively and efficiently produce a fit for purpose ICT. STE offers this perspective.

Through these two approaches the VeSeL research team prepared a “solution designers' resource kit” consisting of a variety of technologies and methods which could be combined, adapted and appropriated to support a participatory exploration of users’ ethnography and requirements to inform possible technological solutions. The kit included a series of activities such as interviews, cultural probes, evaluations of portable technologies and websites, card sorting, observations and some design ‘sketches’ for potential activities with primary schools.

Some of these activities or methods were loosely structured to simplify or initiate cultural discovery or abandoned due to ethical considerations. Nonetheless, the findings have been very useful in informing the design processes as described in the two approaches below.

3 Localised Usability Evaluation for ICT Design

As part of the VeSeL project, one of the farming community groups requested a blog site to promote their projects, such as the eradication of the Tsetse fly, in the hopes of attracting funding from globally distributed users. An early prototype was developed by researchers from the London Knowledge Laboratory. The usability of the blog site needed to be evaluated both with a sample of local (Kenyan) and global (British) audiences before it was launched.

Usability is the extent to which a product can be used by particular users to achieve specified goals with effectiveness, efficiency and satisfaction in a given context [16]. The DUCE method (Developer User Contextual Evaluation) was chosen. DUCE, [21] had been used successfully for many UK commercial developments but not yet for cross-cultural evaluation.

3.1 Usability Results

Elicitation of information from UK users was relatively easy and the feedback obtained was quite detailed. In the case of the Kenya-based users, elicitation of information was more challenging. Furthermore, the Kenyan users were not comfortable with the probing questioning style of the DUCE method. Several of the Kenyan users expressed uneasiness or irritation with the DUCE summary questions. The users also commented that the evaluator was asking the same question in many different ways and they were fed up by the end of the exercise. This was particularly aggravated because the users felt that the responses they were giving to the evaluator might be ‘incorrect’ and therefore with every ‘repetition’ of the summary questions, the users felt their ‘failure’ to be further exposed. In addition, the evaluator felt that the users perceived the entire evaluation exercise as a ‘test’ and every task that was incomplete or incorrect was perceived to be a personal failure leading to 'loss of face'.

It is likely that the Kenyan users felt threatened during the DUCE exercise, which in turn affected their feedback. The challenge then for the VeSeL team was to come up with a means to carry out the usability evaluation without the users feeling threatened.

Although previous experience with ICT and task complexity had a significant effect on user feedback, 'loss of face' was also considered to be important.

3.2 Face Negotiation Theory

'Face' is the public image of an individual or group, what their society sees and evaluates based on cultural norms and values. Conflict occurs when that group or individual feels threatened and fears a loss of face [6]. The Face Negotiation Theory was first proposed by Ting-Toomey [22]. 'Face' is a universal phenomenon because everyone would like to be respected just as everyone needs a sense of self-respect. However, how to manage strategies for maintaining, saving or honouring one's face differs across cultures, [23].

There are three key sets of cultural variables integrated into the face negotiation theory:

Individualism and Collectivism: Individualism is a cultural pattern that is found in most northern and western regions of Europe and North America. Collectivism refers to a cultural pattern that is more common in Asia, Africa, the Middle East, Central and South America and the Pacific, [13, 24]. Due to the importance of 'face', members of collectivistic cultures are highly sensitive to the effects on others of what they say. Directness and especially contradictions are much disliked. It is hard for speakers in this kind of culture to deliver a blunt "no" [6].

Low-context and High-context communication: Low-context communication [11] refers to the communication patterns of the linear logic interaction approach, direct verbal interaction style, overt intention expressions and sender-oriented values [22]. High-context communication refers to communication patterns of a spiral logic interaction approach, indirect verbal negotiation mode, subtle nonverbal nuances, responsive intention inferences and interpreter-sensitive values [22]. Low-context (LC) communication patterns have been typically found in individualistic cultures and high-context (HC) communication patterns are more prevalent in collectivistic cultures.

Power distance: Hofstede [13] defines power distance as the extent to which the less powerful members of institutions accept that power is distributed unequally. For small power distance cultures, defending and asserting one's personal rights is reflective of self-worth esteeming behaviour. For large power distance cultures, playing one's role optimally and carrying out one's ascribed duties responsibly and asymmetrically constitute appropriate face work interaction, [23].

These key sets of variables as integrated into the Face Negotiation Theory framework [23] posit 8 assumptions and 32 proposals. Propositions 5, 6, 9, 10, 11, 12, 13 and 14 address the role of cultural variability in the Face Management process and are used to guide the choice of a usability evaluation method suited for collectivistic cultures.

At VeSeL, we need a usability method that suits a collectivistic culture. According to the Face Negotiation Theory framework, this would be a method that reduces the extent to which the users feel the effect of power distances and in which interaction with the evaluator is reduced or removed. It would be useful to have little or no probing of the users and a means whereby the users provide their feedback indirectly.

The Co-discovery Usability Method has been adopted to suit the collectivistic culture. For comparison purposes, the Retrospective Protocol has been used too. Usability testing took place in April-August 2009 with a sample of Kenyan and British users. Users with at least one year of technology experience were chosen and the tasks simplified. An initial 'quick and dirty' analysis of the collected data indicates that the data collected from the Kenyan users using the Co-discovery Method is much richer as compared to that collected using the Retrospective Protocol Method.

Evaluations such as the ones described above help in understanding how to design for targeted users since they are adapted (localised) to yield culturally valid requirements. However, cultural understanding needs to expand further for three main reasons: (1) a technological solution (blog, mobile phone, application) may not have yet been identified; (2) technology design more or less follows iterative and inter-dependent patterns: requirements -> scenarios -> prototypes -> development -> etc.; (3) stakeholders' decisions and participation are fluctuating and conflicting variables at times. Therefore, an approach is needed to augment not only the understanding of the users but also to explicate the cultural and technological gaps across stakeholders and the resulting impacts on design processes. An STE approach is proposed here to address these gaps.

4 Socio-Technical Evaluation for ICT Design

A socio-technical evaluation of a technology design helps to focus on the centrality of research and design of the technology - "the functions of the system" and "the functions of human cooperation" - in order to find a manageable combination [20]. As Keller [17] sums up, the usefulness of a socio-technical approach lies in the cognitive process of analysis and design. But its "adequacy and expedience" are completely dependent upon the context in situ. Within a global setting like VeSeL, where multiple disciplines, geographical locations, cultures, stakeholders and technology are part of the context, the implications can embody complexities to the design processes and team dynamics.

To effectively capture and manage stakeholders' assumptions, sensitivities, knowledge, expectations and agendas *vis-a-vis* a system design process requires an understanding of the inherent socio-technical issues deriving from the difference between what is required socially and what can be done technically. This is what Ackerman identifies as a socio-technical gap [2]. He argues that "[h]uman activity is highly nuanced and contextualised." It is therefore in the designers' best interest to make those gaps visible and harmonised for a dependable and fit for purpose system.

The VeSeL team has addressed these gaps by designing an online artefact for collaboration called Socio-Technical Evaluation Matrices (STEM) to complement knowledge obtained through localised usability evaluation. For more details on how this has been implemented see [5].

4.1 Socio-Technical Evaluation Matrices (STEM)

The tool is an online form-based system where all stakeholders (or participants) evaluate social and technical requirements or decisions against pre-defined criteria (dimensions and attributes) to highlight dependability issues for both the technology and the users within their own cultural sensibilities.

Initially, an administrator creates a matrix for a design stage around agreed-upon scenarios and criteria of evaluation. For instance, when deciding upon a set of resource kits to be sent to the community for initiation and to facilitate communications, stakeholders initially agreed on the key criteria each kit must encompass (complexity, power need, portability, training required, cultural fitness, ethics, etc.). When a design partner proposes a kit, each stakeholder or its representatives must therefore evaluate the suitability of the kit around these pre-determined criteria. Some of the criteria (dimensions) may have sub criteria (attributes). See figures 1 and 2.

Figure 1: STEM - defining a scenario of design

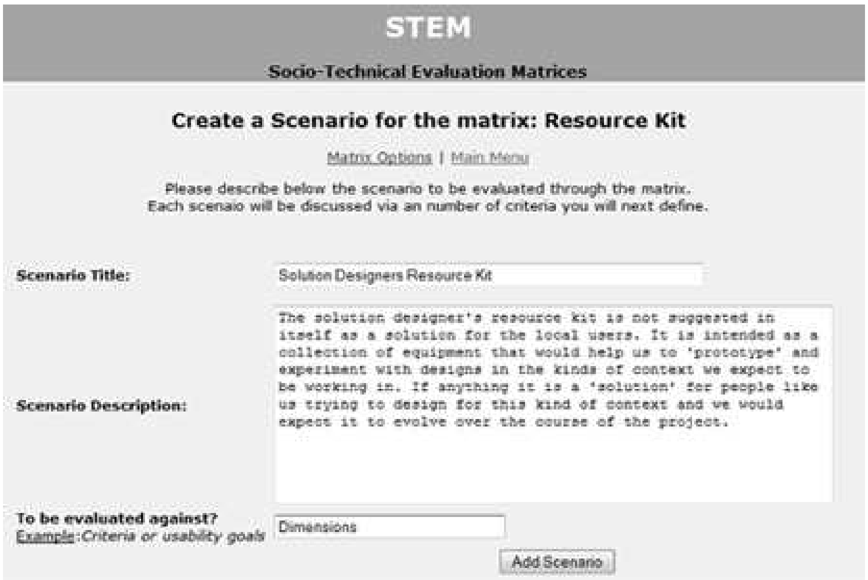
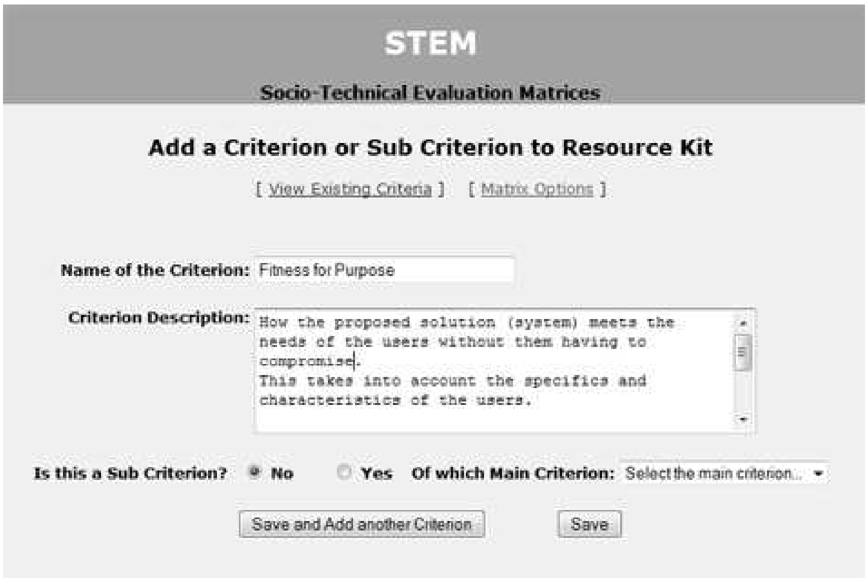


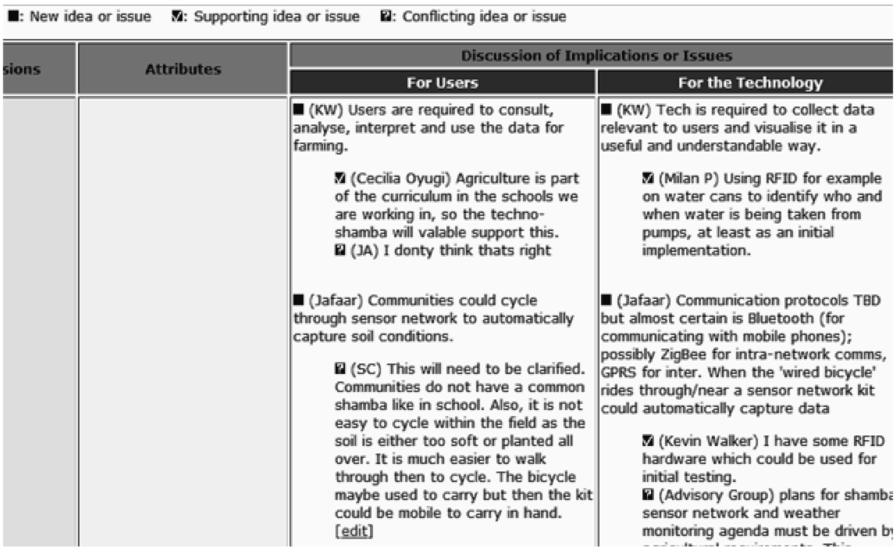
Figure 2: STEM - Defining criteria and sub criteria



These criteria, around which the discussion takes place, must be pre-defined by stakeholders. STEM therefore becomes more relevant as it allows partners to comment on the criteria according to their cultural sensitivity. Criteria are often defined and agreed upon during face to face meetings, telephone calls or emails. The administrator then adds these criteria into STEM and registers all participants to initiate the evaluation process.

Stakeholders participate in the evaluation process by providing their comments/views and other data such as pertinent findings from the LUE described earlier against the relevant criteria. This allows each partner to measure design decisions and actions in terms of their culture, practice and ability. A comment is either in support of or in conflict with an existing comment, or a completely new issue. STEM in that case organises comments according to their inter-dependency to one another. See extract of matrix interface (figure 3).

Figure 3: Extract of a matrix display interface

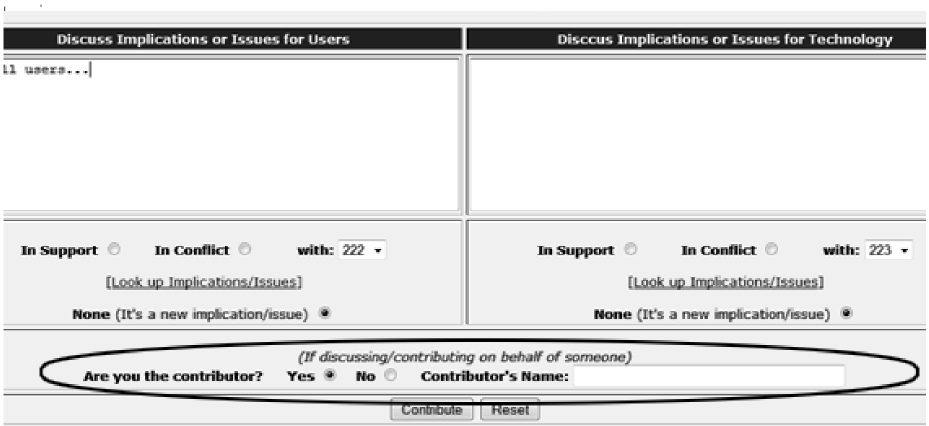


In practice, VeSeL partners have been expressing and revealing more of their concerns and views via the tool by contributing to only relevant criteria of evaluation given their context and culture. They tend not to be concerned with other dimensions about which they have no pertinent comments. However, when design decisions and actions are made here, partners quickly point out any considerations they see as relevant.

Cultural fitness, acceptance and use of technology and design processes are made more explicit via STEM. However, this requires a consistent and good representation of stakeholders in the evaluation process. Without ensuring the participation of a valid sample of stakeholders, the evaluation process remains partial and most critical issues can be fatally missed. For example in Kambu, school teachers felt unease at having all the resource kit assigned to the head of the school as this could lead to more power control and limit the availability of the kit. The LUE revealed a high power distance index as a main cultural factor. Community members tend not to challenge views and decisions made by leaders.

In standard meetings, these issues are hard to express and often only certain representatives are present. This is exacerbated in multi-disciplinary and multi-cultural contexts such as the VeSeL project. Furthermore, the limitation of access to and knowhow about ICT in rural communities makes it harder to evaluate design decisions and actions among all stakeholders. STEM therefore was improved to accommodate this issue by introducing an intermediary process within the evaluation. Stakeholders are able to bring about comments and views of those stakeholders with limited ICT. At times, field trips are organised to discuss issues with community members individually or in groups to harvest their interpretations and comments. STEM interface allows a stakeholder to enter those comments on behalf of the community. See figure 4.

Figure 4: Extract of a matrix comments entry form



The introduction of an intermediate state within the evaluation process may be seen as a delay in the overall progress. However, it is a step that appears vital in subsequent VeSeL successes. Participation has increased and as such design decisions and actions are more dependable and accepted once this level of participation has been reached. VeSeL has recorded a much improved users' intake on ICT as they now accept proposed trainings and activities that reflect their concerns and views. A set of field trips are again planned for November 2009 to collect more users' input on current activities such as the introduction of sensor networks and a donation system.

STEM adoption in VeSeL started with the creation of two matrices dedicated to ethnographic data, one for each village. Once the matrices were populated, face-to-face and technology mediated meetings (emails, Skype, telephone) were used to agree on feasible user requirements and scenarios. This was the first iteration of the matrices. Subsequently, a matrix was created for each scenario of the design process. A moderator was also assigned to each matrix to invite, regulate and report on participations. Previous studies reported the contextual and cultural characteristics of these communities along with the identified requirements through STEM [4, 18].

As VeSeL moves from scenarios to prototyping, matrices are once again iterated for each scenario bringing about previously identified issues and agreements. This iteration process helps VeSeL to deal with the challenges posed by inter-culturality and multi-disciplinarity by consistently exposing them to all partners.

4.3 The Design Setting as Inter-cultural

Interactive systems are subject to interpretations grounded in the cultural spaces of both producers and users [1, 14, 19]. In VeSeL, STEM exposes these intercultural gaps by allowing the different stakeholders to explicate their own interpretive frames and reflect on their own cultural positions. E.g.: while Western partners believe that a minimal trial set of resources should be sent to the communities, local partners see this as an expression of how limited the project will be, thus painting a negative image of VeSeL.

4.4 The Design Setting as an Iterative Socio-Technical Complex

Research on the dichotomy between tacit and explicit knowledge, group psychodynamics and the cognitive shows that while explicit knowledge can be shared or represented using information technology, tacit knowledge is more difficult to represent [8, 12]. In STEM, design decisions for both users and technology are negotiated against pre-defined criteria. A decision that is expressed for one is therefore evaluated in its context and cultural implication for the other. E.g.: in VeSeL, the cost of a technology is often understood as the responsibility of a specified partner or third party. Conversely, in rural Kenya this is culturally a collective effort as identified by the LUE.

The lack of such iterated cultural understanding across partners would result in many subsequent issues. STEM thus augments LUE to address these issues.

5. Conclusion

The impact of context and culture poses many challenges that cannot be exposed as a one-off evaluation in technology design. As the design progresses through the different stages, decisions and actions often result in the emergence of cultural and socio-technical implications. LUE helps expose these usability requirements. However, there is the need for a constant socio-technical evaluation of those requirements to explicate their implications for the development, acceptance, adoption and use of the envisaged technology. The VeSeL team has proposed a combination of two evaluation approaches in the early identification of these inherent issues.

Has LUE been Effective in Informing Socio-Technical Design?
Assumptions embedded in standard usability evaluation techniques did not necessarily match users' interpretations. This is probably because they saw the activities as a measure of their abilities or limitations. LUE has been a valuable instrument to learn the meaning of technology in this context and the perceived usefulness of existing ICT. Engaging with users and getting them to reveal their sensibilities or preferred approaches to technology have been instrumental in informing our design process. Most importantly, the findings obtained with LUE are more valid than those obtained without any previous cultural assessment of its suitability. However, LUE did not give us visibility of the multiple perspectives involved in designing a solution nor did it indicate how certain cultural requirements interacted with other aspects of the socio-technical setting.

Has STEM Addressed the Inter-Cultural Gap in VeSeL?

The use of STEM in VeSeL has been positive but it has also led to a number of new challenges. Using STEM highlighted the many different cultural positions of the members of the team, which in turn clarified which key metaphors and cultural practices should be recognised and included in the user interfaces for Kenya; matrices exposed differences across the expectations of the different stakeholders in the project, e.g. engineers, users, designers, educators, agricultural experts, etc., thus helping to overcome the multi-disciplinary challenge. Without matching the socio-cultural factors to the technological factors in one frame of understanding, the solutions would very likely have been abandoned or face serious setbacks.

For the work of the interaction designers, the value of STEM is immediately recognisable. They require further elaboration on how decisions made at implementation level have a direct impact on technology acceptance, perceived usefulness and usability, such as avoiding text heavy screens, collective learning, etc. This is only possible with early usability evaluation that then informs the STEM.

The combination of LUE methods with an STE facilitated by a collaborative tool has greatly augmented and facilitated cultural discovery as design progresses.

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