Features Analysis of Infographics Editor Using Soft System Methodology (SSM): A Case of Central Bureau of Statistics (BPS) Indonesia

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Abstract: Infographics are a combination of data visualization, illustrations, text and images in a format that can convey meaning or story behind it. Infographics editor is the Software used to generate infographics. The Central Bureau of Statistics (BPS), one of the state-owned agency has developed an infographics editor namely the infographics editor v1 in order to facilitate the creation of infographics in BPS. However, infographics editor v1 still could not meet the features the user's expected. Thus, this research aims to conduct features analysis of infographics editor using SSM that must be able to address both central and regional user's needs in BPS. The analysis included document study, observation, interview and questionnaires to collect related data and information. The result obtained 29 features retained from infographics editor v1, 19 additional features and 6 related non-functional requirements.

Key words: Analysis, requirement engineering, features, design, infographics, soft system methodology, editor

INTRODUCTION

Infographics are a combination of data visualization, illustrations, text and images in a format that can convey meaning or story behind it (Krum, 2014). According to Borkin *et al.* (2013) attributes such as colour and inclusion of human recognizable objects enhance memorability. Infographics editor is the Software used to generate infographics. According to Kennedy *et al.* (2014) infographics editor can help people who are not yet familiar with infographics to create infographics thus an infographics editor could also accelerate the learning process. A very popular desktop infographics editor is Adobe Photoshop. In addition, there many online infographics editors currently available, e.g., visme.co, canva.com, easel.ly, piktochart.com, infogr.am, etc. Central Bureau of Statistics (BPS), one of the state-owned agency has a transformation agenda to provide innovative services aimed at improving the effectiveness and efficiency of the agency in producing and disseminating reliable data in a timely manner in accordance with the needs of data users in accordance with international standards and best practices. Infographics implementation is one of realization of the agenda. Thus, in order to facilitate the creation of infographics, BPS has developed an infographics editor namely the infographics editor v1 by adopting the features of 2 online infographics editors, i.e., easel.ly and piktochart.com. It was expected that users could create infographics according their respective fields. The editor is intended for users from central and regional (local) offices. Thus, the target users is 3044. However, the number of registered users is only 687 users (145 central users and 542 regional users) and the number of active users is only 104. Therefore, it shows that this editor has not been fully adopted. Based on the initial questionnaires by BPS, 19 respondents stated that Infographics editor v1 still could not meet the features they expected, e.g., no ability to change the font size of the text not equipped with categorization, search and map features while BPS works on geographical area, etc. In addition this current editor requires a good network connection in order to provide a response for real-time editing. Thus, feature analsis for infographics editor in BPS is deemed required. The new set of features for infographics editor v2 must be able to accomodate user's needs both at central and regional offices.

Soft System Methodology (SSM) is suitable to analyze vague or hard to define problem that involves human existence and cultural considerations (Wilson, 2001). It deals with problematic situation in which many parties are involved and different perspectives are prevalent such that the goal has not been clearly defined (Jackson, 2003). It leads to a shared understanding among relevant stakeholders (Jackson, 2003). Thus, this methodology is considered useful to perform features analysis of infographics editor. Hence, this research aims to conduct features analysis of infographics editor using SSM that in the end must be able to address central and regional user's needs in BPS. Results of this research is also expected to be one of the references related to the use of SSM to identify features of infographics editor and features of infographics editor for users whose characteristics are similar to those of BPS.
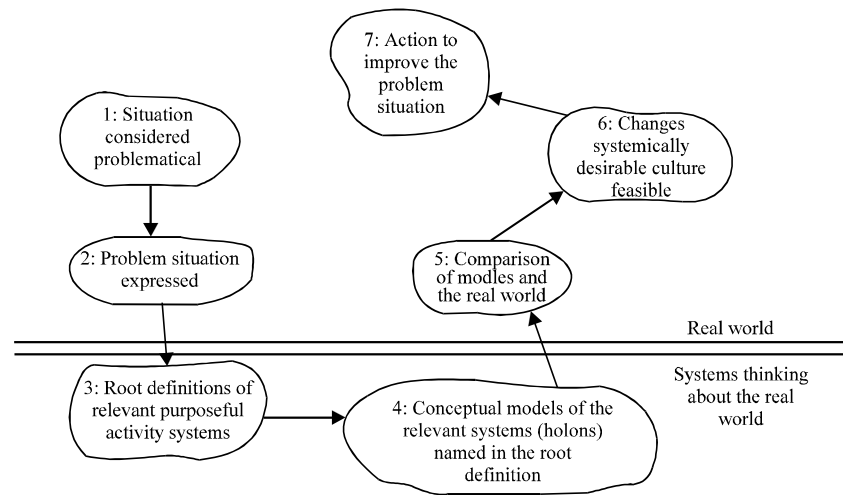
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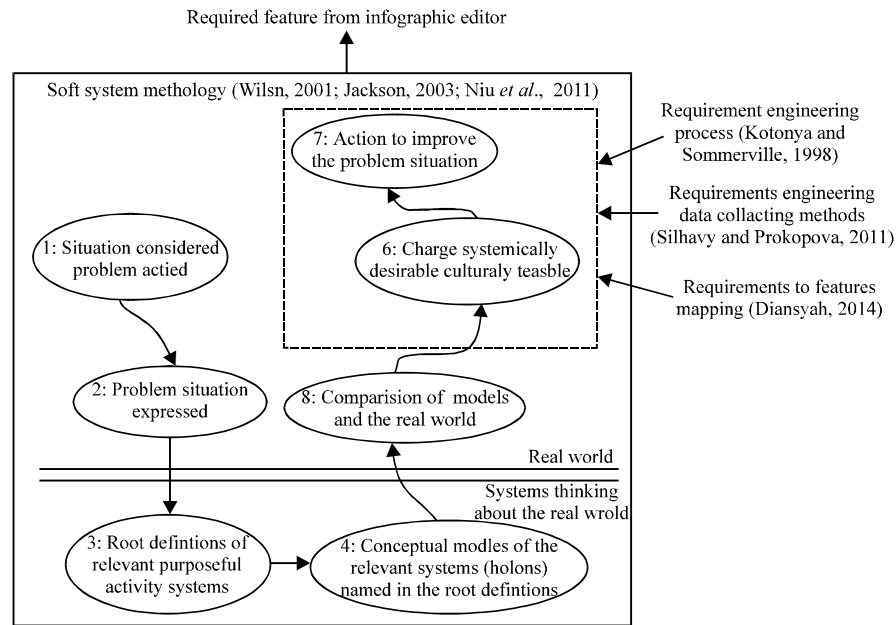Fig. 1: The 7 steps of soft system methodology (Jackson, 2003)

Fig. 2: Theoretical framework

Theoretical review: Requirements engineering is the process to understand what the users desire to dig further, model and analyse requirements, assess the likelihood, define the services of what is needed from the system, identify constraints, communicate and validate requirements and document (Pressman, 2014; Sommerville, 2011; Kotonya and Sommerville, 1998; Niu *et al.*, 2011). Niu *et al.* (2011) concluded that a comprehensive thinking of Soft Systems Methodology (SSM) were able to identify the shortcomings of requirement engineering. According to them SSM is rich in value in researching and improving requirement engineering activities which are centred on human needs. SSM aims to adjust to the problematic situation that is vague/unclear as requirements engineering where there are multiple targets/objectives of diverse stakeholders. The main reason for using SSM on requirements engineering is supported by its comprehensive thinking and systematic modelling. Figure 1 shows the description of the seventh stage of SSM. Hence, along with Scholes, Checkland made improvements in the SSM models by adding a cultural aspect to the methodology (Jackson, 2003). The new representation is then known as the 'two-strand model'. The 2-strand model inserts cultural analysis into a logical model being developed. The theoretical framework in this research is given in Fig. 2.

MATERIALS AND METHODS

This research is classified into an action research in which data are collected from participants to assess or to improve the ongoing processes and also a case study research because it takes a particular focus on a certain area, i.e., the central Bureau of Statistics (BPS) of Indonesia which has central and regional offices. The data collection included documents study, interviews, questionnaires, observation and prototyping (mock-ups).

SSM facilitate a learning process systemic examined and discussed in a variety of viewpoints in a way that can lead to useful measures for improvement (Jackson, 2003). Thus SSM helps to know the situation of the organization by digging as much information related to the situation of the organization as possible from different points of view and also allows improvements (iteration) but remain in the

'fence' SSM so that the process stays focused. SSM consider the history, culture and politics of the organization. By using 2-strands models on SSM, the analysis is expected to be in accordance with the characteristics of the organization. The complete and detailed steps performed in this research which adopt the SSM's phase as seen in Fig. 2 is exhibited in (Table 1).

Interviews were conducted in Stage 1 and 8. In the first phase, Interviews 1 was conducted to get as much relevant information as possible that sharpens the problems. Interview 1 is performed to the director of dissemination of statistics, head of division of organization and management and section head of standardization and changable. On Stage 8, Interview 2 was conducted towards relevant top management when reviewing rich picture, root definition and conceptual model whether it was already in line with real-world

Table 1: Detailed research steps

Input	Start --- Process	Output
Problem identification regulations		
Refulations bureaucracy reform documents	Document study, Interview 1, observation, preliminary questionnaires	Root cause, research goal
Theoretical foundation		
Research goal, relevant theories and previous research	Literature study	Theoretical framework
Methodology		
Theoretical framework	Literature study	Research phases
Problem situation identification		
Organization's structure, process business, bureaucratic reform document, preliminary questionnaires result, customer satisfaction survey result, STATCAP document	Document study	Document study result, Interview 1 transcript, observation result
Problematic situation expressed		
Document study result, Interview 1 transcript	Mapping	Rich picture
Root definition formulation		
Document study result, Interview 1 transcript, rich picture	Cultural analysis, PQR analysis, CATWOE analysis	PQR table, CATWOE table, root definition statement
Conceptual model formulation		
Interview 1 transcript, rich picture, PQR table, CATWOE table, root definition statement, observation result	Mapping	Conceptual model
Conceptual model and real world comparison		
Rich picture, PQR, CATWOE, root statement, conceptual model	Interview 2	Suggestion for rich picture, PQR, CATWOE, root statement and conceptual model
Need improvement? If yes, go to either phase 6, 7, 8, otherwise go to Phase 9		
Follow-up formulation for improvement and changes in real world		
Interview 2 transcript, infographics editor v1, easel.ly, piktochart.com, Interview 1 transcript, preliminary questionnaires result	Observation, mapping	List of questions of questionnaires 1
List of questions of questionnaires 1	Questionnaires 1, mapping	List of requirements, requirements-features mapping, list of features, mock-ups
Action for improvement and changes of problematic situation		
List of requirements, requirements-features mapping,	Questionnaires 2, mapping	Improved list of requirements, requirements-features list of features, mock-ups mapping, list of features, mock-ups

situations. The interviewees were directors of the technical units in the central BPS offices. Questionnaires data collection were done twice at Stage 9 and 10. Questionnaires at Stage 9 were in semi open questions where there is an option "Agree/Disagree" and a text area at which respondents were free to add more answers. The questionnaires were to evaluate existing features of infographics editor v1 and then to elicit additional features needed by the respondents based on research's observation on infographics editor v1, easel.ly, piktochart.com, Adobe Photoshop, Adobe Illustrator and earlier interviews. Questionnaires at Stage 10 were to validate features by providing also mock-ups built by authors based on earlier questionnaires. The target respondents of the questionnaires are all working units staff in central and regional offices of BPS which is counted to 2919. Respondents were contacted by email that contains the questionnaires online link. The email address of the respondents were obtained from BPS Community software (https://community.bps.go.id/).

RESULTS AND DISCUSSION

Initial rich picture (Version 1) was created based on the briefing document of bureaucratic reform team in BPS, documents of bureaucratic reform evaluation by the Minister of bureaucratic reform, statcap web page, customer satisfaction survey, decree of BPS Chief No. 121/2001, Regulation of BPS Chief No. 7/2008 interviews and initial questionnaires. Then cultural analysis was performed as follows:

- Intervention analysis roles involved in the problem were defined
- Client all technical units within BPS central and regional offices (provincial and district/city)
- Problem solver researchs
- Problem owner sub-directorate of publication and statistics compilation

Social analysis: BPS has a vision to be the pioneer of reliable statistical data. It has core values as follows: professional (competent, effective, efficient, innovative, systemic), integrity (dedicated, discipline, consistent, open, accountable) and mandate (trustworthy, honest, sincere, just).

Political analysis: Policies (e.g., bureaucratic reform) defined and applied in central office BPS will automatically applies to the regional offices since regional offices are an extension of the central BPS office. Thus, infographics

Table 2: PQR analysis

Variables	Description
P	Perform text and image editing, data visualization and infographics file management
Q	Easy to understand editor
R	Help design process and file management using infographics editor in BPS

Table 3: CATWOE analysis

Aspect	CATWOE analysis
Customers	All technical unit in both central and regional BPS offices
Actors	All technical unit in both central and regional BPS offices
Transformation	Infographics production depends on the sub-directorate of publication
	Infographics is created independently by each working unit
Worldview	The use of infographics based on PIA to exhibit statistical information so that it is easier to understand
Owners	Sub-directorate of publication and statistics compilation
Environmental constraints	Network limitation in several regions

editor v2 Software will be used by the technical units in BPS central and local offices to implement the policies. The editor is managed by sub-directorate of publication and statistics compilation. While management at the side of the infrastructure is the responsibility of the directorate of information systems statistics. The result of PQR analysis is shown in Table 2. The result of catwor analysis is shown in Table 3.

The root definition formulation used the PQR analysis (or XYZ analysis) and the CATWOE analysis which is given as follows: "a system that is owned by the sub-directorate publication and statistics compilation (O) and operated by all technical units in BPS both central and regional offices (A), making text and image editing, perform data visualization and infographics file management (P) using editor that is easy to understand (Q) towards the entire technical units of BPS both central and regional offices (C) so that it can assist the design process design and file management in BPS (R) given the network limitation in some areas (E)". This root definition was then used to construct the conceptual model (Version 1). Next, a comparison between the conceptual model and the real world was performed in Interview 2. From the interview the rich picture and conceptual model were updated.

From 2547 1st questionnaires sent we obtained 436 responses and 388 valid data. The results were 388 valid data which were then processed and then served as the basis of the second questionnaires. From the 1st questionnaires we created mock-ups to clarify questions in the 2nd questionnaires. From 2509 2nd questionnaires, we obtained 285 responses and 260 were considered valid. From the 2 subsequent questionnaires we processed the data and acquired 29 infographics editor v1 retained, 19 additional features and 6 non-functional requirements. The 29 infographics editor v1 retained are:

- The size choices are in accordance with the needs of users
- User's convenience when creating an infographic with the template
- The size of the working area (canvas) is sufficient
- Pencil tool, line tool, rectangle tool, ellipse tool
- Fonts type on manage text is complete
- Select tool
- Path tool
- Shape library
- Text tool
- Zoom tool
- Eye dropper tool
- Panning tool
- Change zoom level
- Change fill color
- Change stroke color and width
- Change opacity
- Duplicate element
- Delete element
- Bring-to-front/send-to-back
- Change rotation angle
- Change gaussian blur
- Change coordinate
- Ungroup element
- Manage text
- Undo/redo tool
- Shortcut facility
- Import image
- Preview
- Cancel/save

The 19 additional features are:

- Internet connection setting
- Measurement unit selection (default is cm)
- Choices for using a template or not
- Import templates from infographics repository software
- Templates grouping based on most requested data type (based on data needs survey)
- Select type of border to an object such as a dotted line or a line double
- Adjust thickness and line color of an object
- Adjust color properties of an object
- Import form (shape) from infographics repository Software
- Set text properties
- Change font size
- Underline text
- Adjust text alignment
- Zoom out

- Easy to use eye dropper
- Grid
- Objects grouping
- History
- Tool location preference

Recommended 6 non-functional requirements are:

- Desktop infographics editor
- Tutorial or user manual of infographics editor
- The software should be as light as possible so it can run on laptops with limited specs (given the limitations of electricity in some areas making it difficult to use a PC)
- Features and content update (template and image other support) and notification
- Training equipped with regulation
- Better socialization on infographics related topics, e.g., bank image or template

From above features and requirements, further recommendations were proposed for developing infographics editor v2. BPS needs to identify templates and images that need to be included into infographics editor v2. The editor software should be made as light as possible so that it can run smoothly on limited specification laptops. Low-end (low spec) laptops are recommended for installing the editor because many regional areas are having limited/disruptive access towards electricity (regular blackouts) thus PCs are not advisable.

CONCLUSION

This study produced 29 features from infographics editor v1 and 19 additional features. In addition, a recommendation of 6 non-functional requirements was also given. Further research can be performed using prioritization methods, e.g., Entropy method, AHP, etc., to rank features to be developed. Next, concerning the methodology within the SSM we used questionnaires and throwaway prototyping (mock-ups) in identifying and validating the features. An investigation to identify the most suitable SDLC methodology to perform subsequent design and implementation phase can be conducted, e.g., structured methodology vs agile methodology, etc.

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