Improving the browsing and cataloguing experience of the District Six museum archives

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ABSTRACT
The LogosFlow system used by the District Six museum to capture and browse artefact collections is neither user-friendly nor intuitive. It was decided that an entirely new system be built and a user-centered design approach be taken to achieve this. Meetings were held with the collections staff, problems with the previous system identified and possible solutions brainstormed. Human-computer interaction methodologies were applied to the user interfaces and the usability of the resulting interfaces was subsequently tested by the staff. It was found that the proposed system was more intuitive and much easier to use than the LogosFlow system and that with the addition of minor extensions it might be a suitable replacement for the current system.

Keywords
District Six, museum, artefact, metadata, user interface, user-centered design, capture, search, browse, navigation

INTRODUCTION
Currently, staff members in the collections department at the museum complete a paper workflow before capturing the associated data in the LogosFlow system. The actual documentation process is depicted in figure 1 below.

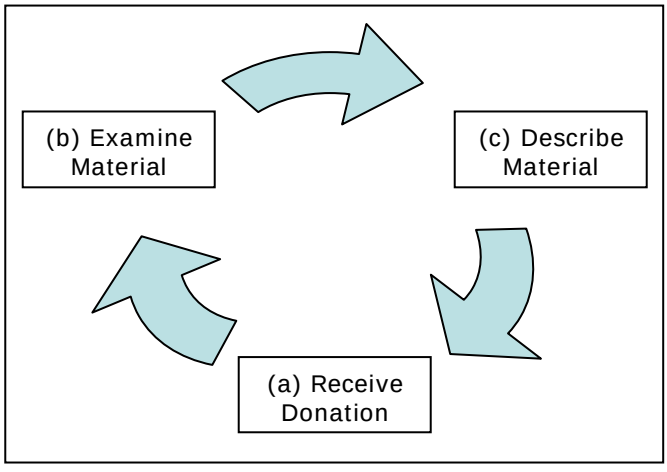

Figure 1: A flowchart of the documentation process

The process is initiated on the receipt of a new artefact (**step a**), be it from a donation, purchase or as part of internal documentation. Once the material has been received and a temporary receipt has been issued to the provider, an accession number is allocated to the item and sub-numbers to each constituent item. This information is then passed on to the development officer so that the donor database can be updated. The material is placed in temporary storage in the appropriate packaging.

After it has been placed in storage, basic conservation work is performed where needed (**step b**). This includes the removal of rubber bands and paper clips, and the replacement of acidic covers with acid-free sheets.

Finally, a full description of the item is completed including details such as the collection title, background and description notes (**step c**). An appropriate storage place is allocated to the item thereafter and the item information is collated into the database.

The LogosFlow system, that was purchased to handle the item metadata, has a number of inherent design flaws. Meetings were scheduled with the collections staff in order to discuss these problems and propose possible solutions for the new system.

The most obvious problems that were identified included the generality of the system, irrelevancy to the District Six project, poorly designed navigation links, confusing forms and the heavily flawed search functionality. A new system, the Multimedia Information Management System (MIMS), was proposed that attempted to address the aforementioned problems and present not only the staff members, but the general public, with simple, intuitive user interfaces and a greater level of applicable functionality.

In order to achieve this, research was done into human-computer interaction methodologies and the results were

applied to the MIMS system. Eventually, tests were conducted on the complete system by staff of the collections department after which the results were collected and analysed and conclusions were drawn.

THEORY

Several human-computer interaction (HCI) design methodologies were researched and take into consideration during the design of the interface. The most common and, incidentally, important techniques that were researched included, affordance, consistency, feedback and role integrity.

Further research was conducted into designing usable menu systems based on course materials provided by Johnson [1]. According to Johnson, the main design aims for menus can be summarized as follows:

- Clear Structure
- Clear Labeling of Categories
- Appropriate Breadth and Depth
- Simple Selection Procedure

Designers are often faced with a trade-off with regards to breadth and depth of menu systems. Either all menu options are made available via a top-level display or items are grouped within sub-menus that are, in turn, accessed from a top-level menu. The former choice results in increased structural breadth and forces users to memorize the location of each item within a category, whereas the latter results in increased depth. The problem with this approach, however, is that high navigation costs are incurred if a particular entry is not found within a deeply nested sub-menu.

According to Wall [2], affordance is (sic) "the level which an object (…) through its design provides an indication of how it is to be used." The higher the level of affordance of an object, the less amount of learning is required to use it. Form buttons are an example of interactive web based components with good affordance. Not only do they appear to be raised off the page's surface, but they are highlighted when the mouse is moved over it, prompting the user to click it.

In a paper published in 1997, Tristem [3] summarizes the ten factors that contribute to failure in HCI according J. Nielsen. Consistency and standards form part of these factors and are said to be vital to ensure that "the user's intention is understood when an impulsive input is given." The principle's main aim is to ensure that the interface components look the same and express functionality similarly. Of particular importance to projects where only a few different interactive components are used, is that consistent key definitions should be used throughout the interface.

According to course content provided by Marsden [4], every user action requires the interface to react appropriately to indicate that the action is complete. This is especially important for components that support several modes (different functionality without changing the component). The user must be made aware of any changes to the mode as failure to do so will result in the interface appearing non-deterministic.

The course content also provides a discussion of the principle of role integrity. Marsden also states that role integrity refers to the fact the user interfaces should not mislead users as to what the system is capable of. If the interface intimates that it is capable of a particular task, the system should be able to perform it. This concept usually applies to hidden limits, for example midi sequencers that can only cope with eight instruments. Generally, limits should be set to zero, one or infinite.

Browsing and searching menus are common and are found on most websites, digital libraries, and library portals. Searching interfaces are well-researched areas and due to the popularity the Internet and Internet search engines most people are familiar with its interface. Google, AllTheWeb, and other search engines offer both basic and advanced searching options. The basic search interface is the same for all sites, and consists of a text field and a search button. The advanced searches however vary from one website, search engine, digital library to another, but are constructed along common principals and offer similar features in functionality.

Before examining the differences of basic and advanced browsing features, we will look at the two parts of a retrieval interface. The first part is where the user enters information and the other is where the information is returned to the user. The information returned to the user is a summary of an item and its purpose is to let the user determine if the item is relevant or not. The goal of designing such a system is to make it as fast and easy as possible for the user to scan the system, while providing enough information to allow the user to determine the items' relevancy. This presents designers with the dilemma of what information to present in the summarised returned information. A similar project was undertaken by students at the University of California [6]. They proposed a system that explicitly exposed the hierarchical nature of metadata in an intuitive and inviting manner to users.

Basic search design is simple and looks the same everywhere. The user is presented with one entry text field in which to enter the target word. Once the target word or phrase is entered the user hits the search button and the results are returned. Usually the user will be able to browse through the results and view those they deem relevant.

In advanced search multiple entry fields are presented to the user, in an attempt to give the user more precise results. The choice of fields to present to the user and how to present it is determined by the search features designers and varies from search engine to search engine. A similar approach was taken by English et al. [7] whereby multiple search fields are provided to user so that the search may be narrowed as needed. The information returned to the user is much the same as that of basic browse; it is just the input from the user that changes.

Browsing principles are less researched and less standardised than those of searching. Most websites and other archiving systems offer a browse option. This is generally aimed at new users or at users who would like an overview of the collection's contents. Browsing can, however, also be used to zoom in on relevant information and is used similarly to that of searching. This can be seen in the popular web directory Yahoo. Web service directories and other cataloging archives also commonly use browsing to assist the user in finding their target information.

The most common structure used in browsing is a tree or hierarchical structure [5]. This can be seen from the interfaces developed. Users are presented with a menu of options, once an option is chosen a sub-menu is presented with options which fall within the users previous choice. At the final level of the menu system users are presented with the information of an item. This can be a powerful design as demonstrated by web directories such as Yahoo.

IMPLEMENTATION

Initial meetings were held with the staff members and resulted in the identification of the following usability requirements:

- Clean layout
- Fast, easy-to-use data entry
- Functional, easy-to-use search
- Categorised browse

To ensure that the final system met the list of user requirements, a user-centered approach was adopted. This ensured that the end-users had direct input into the interfaces and their associated functionality. It was during these meetings that it was decided that the system would be accessible by three classes of user, namely:

- the general public
- data capturers
- administrators

Since any combination of classes could be assigned to a user, it was decided that each individual interface should have a consistent layout and flow, but be specifically tailored to suit the particular class of user.

Figure 2: A comparison of user interfaces and functionality for admin/capturer/public

The fact that the user is bombarded with too much, and at times inapplicable, information is a major flaw present in the LogosFlow system. Separating the functionality afforded to users according to class instead, not only simplifies navigation as there are fewer options to navigate, but reduces the risk of abuse to the system. The previous system made no visible allowance for the deletion of erroneous data; a prime example being the existence of multiple spellings of "District Six Museum" in the Storage

Location table, but which could neither be removed nor edited. Essentially, separate interfaces ensure that users see only that which they should and nothing more.

Navigation

The LogosFlow system is navigated by means of the now standard tabbed pane and vertical menu system as depicted in Figure 3.

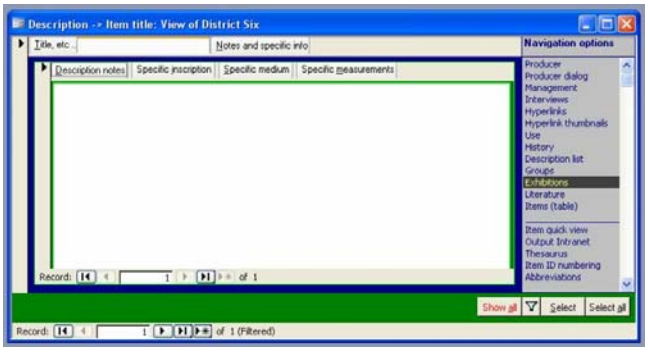

Figure 3: The tabbed pane and vertical menu navigation system used in LogosFlow

Despite the fact this type of navigation system is very common; the LogosFlow implementation thereof is convoluted. Instead of a single tabbed window, its creator opted for nested tabbed windows. In addition, the vertical menu in the right-most panel lists every single menu option. This breadth-based menu layout gives no indication of the way in which data is stored or should be accessed.

Based on similar web based interfaces, a simple hierarchical menu system was designed for the MIMS project. In addition, each class of user is only presented with options that are applicable to their roles.

Entry Interface

The previous system made no attempt to conform to the paper workflow of the museum as it was meant for general use and this departure from the norm had a noticeably negative impact on the productivity of the staff members.

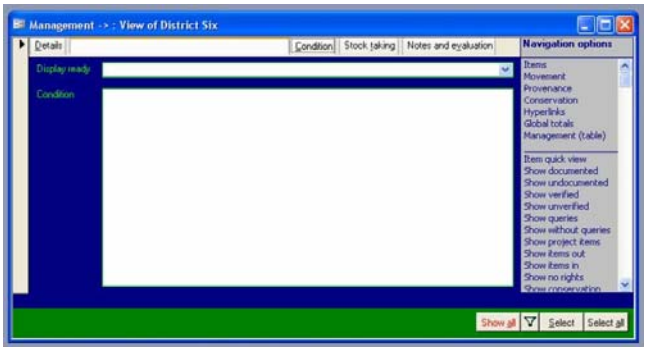

Figure 4: A comparison of the LogosFlow and MIMS entry forms

The principles of least astonishment and consistency were applied to the MIMS system on the other hand by attempting to replicate the paper workflow on digital web forms (Figure 4). To this effect, the entire documentation process spanning from receipt to description was translated into several forms.

Unlike the LogosFlow system, however, the MIMS project presents all the main information on a single form instead of in a tabbed window. Not only does this reduce the number of forms that require navigation by the user, but it also results in the user being constantly aware of the data entered thus far. Previously, the user had no indication of the extent to which the recording process was completed other than the position of the tab.

While it was important to maintain the one-to-one relationship between the paper workflow and the web forms for consistency, it was concluded that certain time-saving features were required to make the user interface more powerful without comprising usability.

Stickies

Data capturers currently receive item metadata in batches sorted by various criteria including collection title. To facilitate the entry of data for large numbers of items, “sticky” functionality was added to form fields. By marking a field as sticky, it ensures that the marked field retains its value for future records. This is demonstrated in Figure 5.

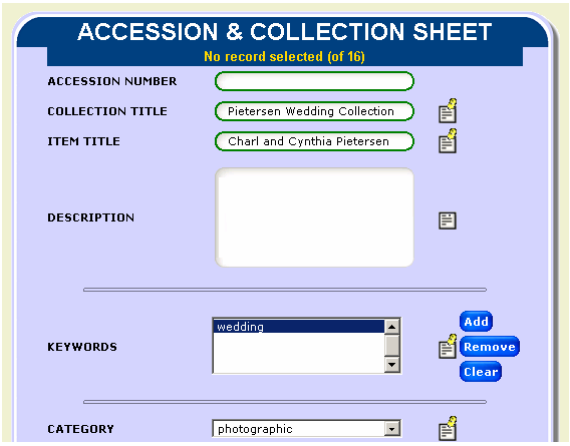

Figure 5: The "stickied" fields retain their values after a recorded is added

Consider a case where fifty photographs must be entered into the system, all belonging to the same collection, catalogued by the same staff member, taken by the same photographer and stored in the same location. By utilizing the sticky functionality, the amount of work required by the user is reduced by approximately 60% (12 of 20 fields can be made sticky).

Auto-complete forms

It would unrealistic to assume that item data would reach the capturers in perfectly sorted batches. Instead, it would seem more likely to arrive haphazardly in small batches, punctuated with arbitrary item data.

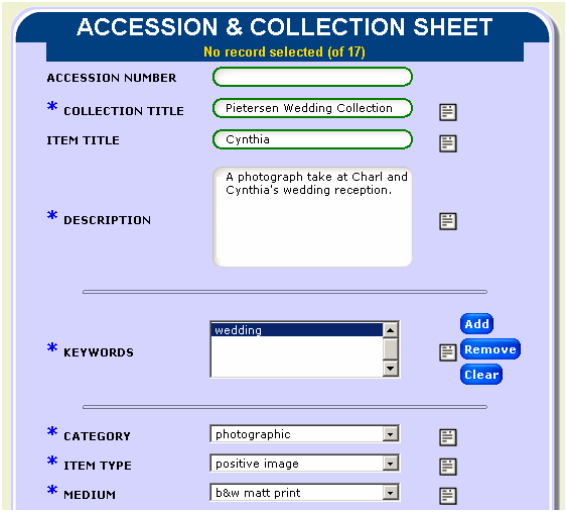

Figure 6: The automatically completed fields are marked with a blue asterisk

To facilitate the entry of these batches, the system caches the data for each entered item. When the user comes across an item that shares information with previously entered items, one or two identifying fields can be filled in manually and the rest will automatically be completed, and marked as having been so, by the system. An example of this operation can be seen in Figure 6.

Automatically updating tracking form

At the time of implementation it was uncertain whether or not the tracking form would be required in future. To accommodate either eventuality, it was decided to loosely couple the tracking form to the item metadata form. The MIMS system allows users to complete the tracking form as is necessary, but users need not refer to the tracking form at all. Instead, the system automatically completes the tracking form as the item metadata is completed. Once the tracking form no longer forms part of the paper workflow, it can just as easily be ignored in the MIMS system as it will be taken care of automatically.

Retrieval

Searching is more popular than browsing, but in a small catalogue such as the D6 collection, a user unfamiliar with the collection can use browsing to familiarise themselves with the collection. Once a user is familiar with the collection, more precise information can be looked for through the searching option.

Items in the District Six collection contain many fields. These fields store information regarding the items. Example fields are: title, collection, production date, description and storage.

In searching the results are returned in order of relevancy. A subset of fields is returned in the results to allow the user to check returned items for relevancy. To obtain the best summary for each item, developers asked the expert users for their input on which subset of information had to be displayed in the returned results. Both basic search and advance search return the same fields in its results. This benefits the ease of use as a user will be able to examine results of both basic and advance search features.

The browsing feature however returns a different subset of results for different browsing options. There are two fields which are always displayed in the returned results. These are the "description", to aid in relevancy and the "accession number" which serves as a unique identifier to the object. The other fields returned with a browsing option are browse-choice dependent. This was done because if a user was browsing by "item title" they may only be interested in knowing the "title", the "description" and "accession number". None of the other fields may be needed in determining the relevancy of an item.

Basic Search

Basic searching and advanced searching have different user interfaces. The basic one only has one text field and one button. This interface is depicted in Figure 7.

Figure 7: The basic search interface with sample returned results

Advance Search

The advance search feature presents the user with an interface which is customisable. The user is able to construct a query made up of a number of sub-queries. A sub-query consists of a text field, in which the target word or phrase can be entered; it has a drop down menu to identify the target words status, and a drop down menu to identify the field which the word is associated with.

Drop down menus are used to constrain the user to only valid input, as there is only a limited number of "fields" and "status" choices which exist. The target word is a text field as there are potentially infinite target words a user could enter. In addition to the sub-queries which exist on the advanced interface. There are the following buttons:

- "add query" button, which adds another sub-query to the page. The new sub-query can then be given a target word, a status and a field.
- "remove query" button, which removes the last sub-query from the page.
- "clear" button, which removes all the sub-queries on the page.
- "search" button, which signals to the program to return the results to the user.

The status fields which exist are "preferably" "must be" and "not" and have the following interpretations:

- "preferably" searches for the target word or phrase in the stated field and returns items which satisfy the constraint.
- "must be" searches for the target word or phrase in the stated fields and returns only items which have the target word in the stated field.
- "not" excludes all items in which the target word appears in the stated field.

A number of sub-queries can be added to the page to define the exact query needed for the user's specific needs.

The simple interface described above and depicted in Figure 8 has almost all the flexibility and power of the complex advance searches provided by large Internet search engines. The interface presented is not capable of performing special queries. This is not was not need by the museum and thus was not included in the design.

Figure 8: The advanced search interface with sample returned results

Basic Browse

The basic and advance browse has different interfaces in the user input section as well as the return values section.

Figure 9: The basic browse interface

As can be seen in Figure 9, basic browse, for its input, simply provides descriptive links which the user may click on to view the collection by the chosen constraint. This requires little effort from the user's point of view. All they need do is click on the link and start browsing the collection. To decide on which browsing options to use in basic browse, the expert users of the museum supplied the information on which are most popular browsing categories

requested by its users. These choices were then added to basic browse with the necessary return fields that should be returned when a user browses via the option. This aims to make the regular actions of the user easy and fast.

Advanced Browse

An advanced browse field differs from the basic in that a user may want to state which fields they would like to return and by which field the returned results should be ordered. Advanced browse allows for this customisability.

Figure 10: The advanced browse interface

Similar to advanced search the user may construct a custom query. This is demonstrated in Figure 10. There are two parts to the query, one is the fields to return and the other the fields by which to order the results. Any number of "order by" and "return" statements can be added. Each "order by" and "return" statement has drop down menu constrain the users to only the existing fields.

The advanced browse feature contains supplementary buttons:

- "add return field" button, which adds another return statement to the query.
- "remove return field" button, which removes the last return statement from the query.
- "clear" button, which removes all the return fields.

Similar buttons exist for the "order by" statements.

- "browse" button, which executes the users query and displays the results.

Using the simple design above, user's are able to construct many different constraints that may be used to browse the collection.

Navigation

The system has basic navigation for user to find their way around the interface. The search page has links to the advanced search page and it has links to browse page. The browse page in turn has links to the advanced browse and the search page. The browse and search pages have these links because a user may want to switch from browsing to searching while in the middle of a browsing operation.

The results which are displayed to a user when querying the system have previous and next buttons on both the top and bottom on the page for convenience. The results page summarises the information in the results by indicating to the user the number of results found, which results and which page of the results they are currently viewing, and by which category they are browsing the collection.

Level of Detail

When viewing the results of a query the user is only presented with the amount of information needed to check if the item is relevant. If the user deems the items to be relevant the rest of the information of the item can be viewed by clicking on the link presented in the results.

However, if the user is using the advanced browse option, the user may state the return fields to be displayed in the results, and then view the rest of the information when clicking the link.

EVALUATION

Entry

User testing was conducted at the District Museum under controlled conditions using the machines available in the collections office. Test cases were derived from the use case diagrams to ensure that all facets of the user interface were examined and compared to those in the LogosFlow system. This comparison was necessary to determine whether or not the HCI techniques used in the project were successful or not.

Six tests were drawn up to compare the following functionality:

- Data entry
- Data manipulation
- Authority list manipulation
- Maintenance

At the completion of each test, users were required to compare and contrast their experiences with both systems. The actual times of completion were not necessary and a qualitative assessment was made and recorded instead. This kind of test was acceptable as the primary aim of the project was to streamline data entry to improve the task completion time relative to the time taken for the previous system.

Unfortunately due to time constraints and limited facilities the tests were conducted with only four museum staff members in a three hour session. Three staff members can be considered to be expert users as they had had prior experience of the LogosFlow system, while the other member had only dealt with the paper workflow. It was decided to split the users into pairs prior to the actual test, but this was not possible as the fourth user arrive half-way into the session. Instead, the inexperienced user was partnered with an expert while the other expert worked individually (the fourth participant eventually joined the individual expert).

"Think out loud" evaluation was employed to attempt to understand the users' thought processes. They were required to explain what they were doing and the reasoning behind their actions, after the completion of each task. It was hoped that this would reveal whether the interface was intuitive or not.

Retrieval

The test of the retrieval system looked at the functionality and whether the interface was usable or not. The interface of the retrieval section directly links up with the functionality of the system. Uses were given a set of tasks to perform using the system. Once the user had successfully performed the task the user ticked it off and moved along to the next task. The test involved all 4 interfaces of the retrieval system, basic browse, basic search, advanced browse and advanced search.

In the browse functions the users were asked to browse the collection by the stated option (basic) or constraints (advanced). In the search functions the users were given searches to perform using basic search, and then given searches to perform using the advanced search. These tasks covered the range of searches and browses which a user would most often perform on the collection. If the users found the system to be usable enough to complete these tasks, then the system was deemed to be both usable and functional.

The system was tested with the expert users of the District Six museum. Of all the users they will be using the system most often as they are the owners of the collection and know what information outsiders require of the collection. The retrieval system is, however, for both the public and staff and for this reason the retrieval system was also tested by public users. The same tasks were performed by both staff and public.

CONCLUSIONS

Entry Interface

Throughout the tests, the users appeared to be more at ease with the MIMS system. Qualitative observations of the users during this time supported the proposition that entry of metadata was faster in the MIMS system than it was in the LogosFlow system. Perhaps more importantly, the user who had had no prior experience of either system became accustomed to MIMS much quicker.

These results bode well for the training of future capturers as it appears that the new system reduces the need for technical support (the tasks were completed with minimal input from the observer) and the amount of time required for training.

Retrieval Interface

After testing with both the District Six museum expert users and the public users, it was found that both groups were able to perform all tasks given. This indicates that the system is usable.

FUTURE WORK

Although the tests were conducted with expert users, it would be idealistic to simply conclude that the system is usable. A better measure of its usability could be obtained by employing other testing methods, including heuristic evaluation and cognitive walkthroughs. These methods employ more rigorous forms of testing and would be ideal if a sufficient number of participants could be found.

It might be beneficial to determine the approximate amount of time saved entering data into the MIMS system compared to the LogosFlow system. A reduction in entry times could safely be attributed to a more user-friendly system as the users would have had no prior experience of the system. In addition, it might be prudent to perform such tests in a distributed environment so as to determine the performance of the system under real-world conditions. While controlled lab conditions are sufficient for theorizing, field tests are generally required for more concrete evidence.

The District Six museum does not currently have an organized collection of digital artefacts and, as such, the staff did not think it important to include samples of the associated item media. It would be a trivial task, however, to include support for hyperlinks to multimedia as most internet browsers have built-in support for that kind of content. It would be more challenging to determine an efficient and future-proof storage method for the selected

content though, as the staff has not yet selected detailed standard specifications for the various types of media.

Retrieval

As computer users are accustomed to drag and drop features offered by applications, this feature should be considered to make tasks easier to perform by being able to drag and drop constructs to generate the queries.

To this effect, three listboxes could be used: one listbox will be filled with the user's choice of categories to browse by, and the other two start off empty. The user could then drag categories out of the available listbox into the "return fields" category listbox or "order by" category listbox. For additional structuring of "return fields" or "order fields" a user may drag and drop items within a given listbox to set the ordering within the listbox itself. This should increase the convenience with which queries are constructed.

An advanced browse or search query is made up of number of sub-queries. The current design of the system only allows a user to remove the last sub-query that was added. The interface could make allowance for the user to mark a sub-query for deletion by right-clicking on the sub-query. This does not improve the functionality of the system, but it does make the system slightly more convenient to use.

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