A digital planning tool for sales racking

Andreas Larsson
Abstract

A digital planning tool for sales racking

Andreas Larsson

Planogram planning at IKEA Uppsala is in need of modernisation since it currently takes tens of years to become efficient and produce accurate planograms. The difficulties each planner is faced with will be brought to light, analysed and, if possible, addressed with a digital solution in the form of a desktop application for market hall planogram planning. During the development several design choices were made and motivated as the process continuously received input from Sales and Supply Support Specialists at the IKEA Uppsala store who oversaw the project. The final application was tested and evaluated by co-workers from IKEA Uppsala with planogram planning experience who deemed it as a competent tool that, with some further development, could be put to good recurrent use at the store. Further it was concluded that planogram planning is in need of modernisation and by digitalising it the planograms will become more precise and less time will be spent on the planning and the training of new planners. There are no spot on solutions on the market today and since this is not believed to be a problem just at the IKEA Uppsala store but at IKEA in general it would be beneficial for a national wide inquiry on how to digitalise the planogram planning for all IKEA stores throughout Sweden.
Glossary

**ASSQ**, summation of all sales space quantities for a product.

**CSV**, a file format which separates values with commas.

**GADD**, (sometimes GADD-list is used) a database program available locally at IKEA to retrieve data and statistics about product selection all other operations at the local store.

**GUI**, a Graphical User Interface.

**Mixpallet**, to keep down the cost of transportation and stockholding many low turnover articles are shipped together as multipacks on a single pallet.

**Multipack**, a packaging containing multiple units of the same products. Many products at IKEA are delivered in multipacks.

**Planogram**, visual representation of how products are placed on a sales rack, includes the number and location of each article.

**RSSQ**, recommended SSQ based on the sales forecast.

**Sales Rack**, collective term for sections product shelves.

**Sales Solution Report (SSR)**, a datafile containing nationwide article information.

**Sales and Supply Support (SSS)**, a team of specialists that assists other departments with analysis, planning and forecasting.

**SSQ**, Sales Space Quantity.

**TM**, Turnover Margin, levels are low, medium and high.

**UI**, User Interface, the part of a program that a human user interacts with.

**UX**, User Experience, the interaction between the user and the application.
1 Introduction

1.1 Background

The IKEA Uppsala market hall houses thousands of products of which a great deal are located on sales racks. These racks must be carefully planned to fit all intended products and their respective volume, a volume that is ever changing due to the sales forecast. Today the sales co-workers do this planning by hand on a piece of paper. A great deal of time and effort is put into planning the layout of the products for each racking section (a planogram). For each article there are multiple parameters to keep in mind such as the number of pieces of a multipack, the recommended sales space and the weight of the products (to not overload the rack). In turn there are multiple articles located on the same rack which makes the process of keeping track of all parameters for all products tiresome and prone to error.

The Sales and Supply Support department (SSS) is looking for alternatives to the approach above to increase the efficiency of the planning which will give the sales co-workers more time with their customers and the customers a better shopping experience. There are applications on the market today which have the features necessary and some have been used to various extent in different projects but not in day-to-day operations at the IKEA Uppsala store. To invest in an existing software solution is a cumbersome task and if it later proves not to improve the planning made by the sales department then it would all have been a waste of time and money. SSS is therefore looking for a simple application which only focuses on the planning of sales racks in which it aids the planner to keep track of all parameters necessary for each article in the rack. If this proves useful to the point where the benefit would outweigh the cost the intention is to start looking for a full solution which not only handles sales racks but other types of sales locations as well.
1.2 Current planning method

At IKEA it is possible to acquire all data necessary to make an informed decision of how to arrange the sales racking to fit the products. By using the tool Gadd Analytics, one can easily retrieve data sheets of product information such as article numbers, whether or not they are delivered as multipacks, the size of those multipacks, RSSQ, their TM and more. Information
about available racking and their specifications are available as regularly updated brochures on the IKEA intranet. With the current planning method (as visualised in figure 1) the data gathering is done by extracting excel sheets from Gadd Analytics and the processing and analysis is done by hand using an empty racking template on a piece of paper.

1.3 Problem definition
The planogram planning tool which will be developed will digitalise the two loops in figure 1 with the purpose to streamline the planning process and reducing the possibility of human error. The tasks performed in the two loops are repetitive and concerns a lot of variables/values which are constantly updated and dependent on each other. These characteristics makes the problem well suited for a machine and not so much for a human being.

1.4 Delimitations
For the scope of this thesis project the application only handles racking with a width of 60cm or 90 cm. There are several other types of sales locations at IKEA such as bins, full pallets and custom-made shelves. Since the 60cm and 90cm racking are the most common and cumbersome to plan they have been chosen as the focus for this planning tool. The tool itself will only function as an aid to the planner and not contain any automated planning functionality.

2 Related work
Below follows a brief description of three on the market solutions for planogram planning which, with some adoptions, could work as solutions for the problem at hand. By searching the web for planogram tools there are several solutions available, the three below have been picked since they together fairly represent the different kind of tools available today (in the sense of functionality and availability). If not only planograms are to be considered but also store layout and warehouse racking, there are fewer but full-scale solutions available. This would demand a grander change of the entire retail planning and analysis process for the entire IKEA group which is outside the scope of this thesis project. Due to this, only the tools concerning planograms are considered in such systems.

RELEX offer a full-scale solution for the entire retail, goods flow and workforce planning process and consists of several tools that work together to optimise the different tasks in that process. The individual tools are built to be working together by sharing prognosis, sales forecasts and delivery schedules and to get the most out of the platform an entire migration to RELEX for all these tasks would be necessary. The individual tool 'Space and planogram optimization software' can be used on its own if fed with product data, sales forecast, etc. from other sources. It is possible to design custom fixtures for planograms, drag and drop products onto shelves is supported in both 2D and 3D. The program also includes a drag and drop floor planning feature [1].

The 'Space and planogram optimization software' can be used in collaboration with other store/offices as well. Planograms for several stores can be created externally (at a head office) and then distributed to the individual warehouses which in turn can finish the planograms with local market insights. Since the RELEX suite is quite comprehensive and all functionality is not gained unless the entire platform is used there is no pricing information available online. If it later is decided to move forward or investigate the RELEX solution further there would be a lot to gain in cooperating with other IKEA stores throughout Sweden.

GoPlanogram a web-based platform which allows users to collaborate on planograms using a common database of product parameters. The parameters are imported to the tool via CSV or XLSX files which need to have a specified format. Along with the product information images can
be added so that the planogram visualise images of products on the shelves. In addition to some mandatory product information (such as dimensions and weight) custom fields for each product can be added. GoPlanogram comes with different types of fixtures which are said to be customisable but not to which extent [2].

GoPlanogram uses a subscription method with an annual fee for each user in the organisation [3]. The platform is located on Amazon Web Services, but local server options are possible if that is of interest to the organisation. The program has a desktop version which includes all functionality, including analysis tools and custom features while the mobile version is limited to very simple planogram viewing and editing.

**SmartDraw** is a tool for creating diagrams but it can also be used to create planograms. Product information is importable via XLSX files and can be applied to shapes/object on the canvas. There are preloaded shapes in the toolbox and custom ones can be created by the user. It is also possible to create data rules to shapes, for example if a data field of a shape does not uphold a criterion it can be displayed in an alerting colour [4].

The tool is run within the web browser and collaboration is possible using shared folders and link sharing. There is a free trial, but the full platform is available for one or multiple users for an annual price [5] and created planograms can be exported as drawings into the Microsoft office suite [6].

**Comparison of available solutions**

While all tools above have some merit and may work to solve the problem at hand (or parts of it) there is not a single one that fits the desired solution entirely. The most competent solution would be the one presented by RELEX. It is however a full-scale solution and the migration of the entire goods flow process is out of scope of this thesis project. By only considering the ‘Space and planogram optimization software’ it contains all features necessary for a planogram tool at the IKEA Uppsala store. Based on the information available [1] it seems like it would be beneficial to use the tool in co-operation with other IKEA stores throughout Sweden.

SmartDraw contains all functionality that is required for the scope of this thesis project and for a few smaller planograms it may very well work. The issue with transitioning to SmartDraw would be when it is time to scale up and extend the planning tool with more functionality. As mentioned above it is possible to set thresholds for products, a useful one would be to turn a product red when it does not meet its RSSQ and then green when a sufficient amount of that product is added to the section. In the current version of SmartDraw it would have to be set individually for each product which would be time consuming and prone to error, making it an undesirable choice for scaling up to sections with many products.

Lastly GoPlanogram is considered. From the information available on the web page, it seem to have the features necessary to comply with the demands of a planogram planning tool but there are some concerns when it comes to adapting it to the data available at IKEA Uppsala. First of all, it is a bit unclear how customisable the fixtures (types of racking) are. If it would be possible to convert the information available on the IKEA intranet concerning racking dimensions, pieces and specifications into custom fixtures it would be a good start. Some alterations must be made to the data sets containing product information before loading it into the platform. Today there are several XLSX files with different types of information that together makes up for dimensions, weight, RSSQ and TM. These must be merged into one, which comply with GoPlanogram’s import format.

The tool developed in this thesis project will handle the most stressing aspects of planogram planning as defined by the users. If the tool or a subset of its features proves helpful to the planogram planner then one of the solutions presented above may be the way to move forward. More discussion on possible ways to move forward will be done in section [6].
3 User input and priorities

3.1 First survey

An initial survey was sent to nine people at IKEA Uppsala with planogram planning as a part of their job. The survey was made anonymously and out of the nine people seven responses were submitted. Note that all seven did not respond to all questions. The survey was divided into three sections, the first contained questions where the respondent were to rank different parts of the planogram planning process based on their difficulty, the questions covered both racking combinations (figure 2) and product selection (figure 3). For a full view of the survey see appendix A.

![Figure 2: Respondents’ answers to different aspects of racking planning ranging from 1 (easiest) to 4 (most difficult)](image1)

![Figure 3: Respondents’ answers to different aspects of planogram planning ranging from 1 (easiest) to 5 (most difficult)](image2)

In the second section the respondents were asked to rank the different parts of the planogram planning process in the order of which was the most important for them to get assistance with. This...
would be used as a way to prioritise the order of implementation when constructing the application. Further the section contained questions on the user interface. A third of the respondent preferred an application in Swedish while the rest did not care whether the application was in English or Swedish. A clear majority prefers an application with a dynamic canvas, i.e., where racking sections and shelves can be added/removed throughout the planning process. An interesting question which impacts the graphical user interface (GUI) concerned how the application should visualise products on the shelves. Should it be an interactive GUI where the user drag and drop products into their exact locations or is a summation interface enough where the user only selects the quantity of a product on each shelf and not its exact location. This question got six responses and resulted in a 50/50 answer. In addition, a clear majority of the respondents would like a warning if the RSSQ of a product is not reached and the ability to save their work to continue another time. A must would also be the ability to print a summary of the rack containing information on what shelves are used, the products placed on those shelves and their respective quantities.

Finally the survey contained a section about the respondents’ experience with planogram planning. More than half of the respondents have had planogram planning as a part of their job for more than three years. On a scale of one (easy) to five (difficult) the mean of the responses placed the current planogram planning method as 3.14 with only one respondent placing it < 3, that respondent has more than ten years of experience planning planograms. One respondent who has had planogram planning as a part of their job for 1 – 3 years classified the task as a five. This indicates that the method may get easier with time and experience but the time needed to build such a competence may be very long and can make it difficult to train new colleagues and successors in planogram planning.

Combining the knowledge from the second and third section of the survey it can be concluded that 'Keeping track of multipack dimensions' is the most difficult task and it does not become easier with time and experience. 'Staying within racking max weight' is a task that become easier with experience sine the two most experienced co-workers rated this as a low priority. It may be due to repetition or there is a method/way of thinking to handle this and it can therefore be taught to new co-workers. Thirdly the task of 'Keeping SSQ to RSSQ', is a task that does not become easier with time according to the survey. The three most experienced co-workers rates this evenly as a 3/5 while the three co-workers without as mush experience mostly rates this at a lower priority. Either the new co-workers have found a new way to deal with this issue that had slipped by the
more experienced or they do not understand the planning process and the importance of keeping a SSQ to the RSSQ as well as the more experienced co-workers. The conclusions drawn from figure 4 will have a direct effect on how the application is designed and implemented. Some of the features are to just collect and present data in a friendly way which is a quite easy task compared to the more advanced features such as keeping track of the load on a shelf. Further conclusions are presented at the end of sections 3.2 and 4.2.

3.2 Identified areas of improvement

The specialists at SSS identified that the planogram planning process was outdated and too often resulted in inaccurate planograms which led to issues in the store’s fulfilment and goods flow process. They further recognised that the process of keeping track of multipack dimensions, RSSQ values and how much room was left on a rack was the most difficult part and should be digitalised where an application could assist with this. The same would be for the different types of racking combinations available. Based on the results from the survey presented in section 3.1 the initial assessment from the SSS specialists was correct but the survey includes the necessary information for prioritising the importance of the different features in relation to each other. Some parts of the planning process would not be possible to digitalise or not worth the time and effort to make such an implementation for this thesis project. This includes measurements of the walls where the racking will be built, selecting the appropriate products for that section and automatically retrieve product data from a server. Based on the survey and SSS specialists’ assessment the planning tool would place its focus on building the racking dynamically, importing existing data from Gadd Analytics and most importantly provide a simple UI. The planning tool would implement an interface where the user can add/remove product quantities from shelves while having an overview whether the RSSQ’s are met and the rack is not overloaded (in terms of weight and volume). This is represented as the two loops in figure 1 from section 1.2.

4 Technical implementation

4.1 Requirements and choice of framework

The only requirements from the SSS specialists on the application’s technical implementation was that it should be able to run in a Windows 10 environment, use the data supplied by Gadd Analytics (xlsx format) and a simple 2D user interface would suffice as long as images of the designed sales rack could be saved as image files locally on the computer. There are several programming languages with the capabilities to handle the requirements such as C++, Java and Python. Due to personal preferences and previous experience Python was ultimately chosen for the implementation along with a set of libraries to handle data management. The user interface was implemented using PyQt5, a Python version of the Qt framework which is used for creating graphical user interfaces. Qt has a publicly available GUI for creating windows and dialogues which then automatically can be turned into executable python code. The basic layout of the UI was created with the Qt Designer and then connective functionality and backend data management was created by explicitly writing the code. PyQt was chosen over other Python GUI alternatives such as tkinter due to its advanced features, documentation and the Qt Designer tool.

4.2 User Interface

The mantra in the design of the user interface is 'simplicity'. The process which is to be digitalised has so far been done using a paper with a printout of a rack section where the planer draws shelves by hand. The limitations have not been the visual representation but managing and keeping track of all data in a concurrent manner.
From the initial user survey it was clear that the feature with the highest priority should be to keep track of multipack dimensions followed by presenting the SSQ and RSSQ values and warn if the sales rack capacity is exceeded. A delimitation of the application (as mentioned in section 1.4) is that of automated planning. This implies that the user will only be responsible for filling the sales rack with the intended products and their quantity. Combining the user priorities with the delimitations divides the responsibility between the user and the application in a clear way.

At startup the user is provided with a startup page with all options the user needs to get a quick start. It is possible to create a new or open an existing project, change the language or launch a help section. Once the user is past the startup page it is no longer possible to return to it but all functionalities can be found in the menu bar.

The main window of the UI is divided into three sections. At the top of the window there is a menu bar with all functionalities that the user will need to setup the application. Creating new projects along with opening/saving project to a file. Exporting information such as images of each section and a xlsx file containing rack specifications and the products placed at the different shelves. The application relies on data being imported by the user from three different xlsx files, the files can be imported one by one, so it is possible to open a saved project and load it with a new xlsx file with new RSSQ values. From the menu bar the user can switch application language between English and Swedish and launch a help section in a new window which contains pictures which explains the different menus.

The rest of the main window is divided in two along the vertical axis. To the left there is a graphical section where the sales rack is constructed and to the right a table view containing product information for each rack section.

It is in the left part of the window the sales rack is created and populated with shelves. As requested by the majority of the respondents to the first survey, the rack can be constructed dynamically where sections and shelves can be added/removed throughout the entire planning process. A common way of constructing sales racks is to have the same shelf structure on neighbouring racks, it is therefore possible to duplicate a section meaning that the user can create one section to use as a template for the others. Each section has two configuration windows, one for the wallbands and
section width and another for the shelves. These are accessible via a menu that is shown when right clicking a rack. Any changes made through these dialogs are not displayed in the application until the dialogs have been closed by the user. This was due to an early decision in the implementation process and it violates the intuition that the user should see any changes as they happen. It is expected to have some form of feedback from some of the users regarding this behaviour.

Figure 6: Sections are being constructed, products added and their quantities adjusted.

On the bottom there is a progressbar showing how much of the section’s volume that has been used. It is colour coded with green, yellow and red using the following conditions:

**Red**: if the loaded volume is below 70% or above 120% of the section’s capacity.

**Yellow**: if the loaded volume is between 70% - 90% or 105% - 120%.

**Green**: if the loaded volume is between 90% and 105% of the section’s capacity.

The volume bar is meant to give the planner some indication of what the filling rate of the section is. Since the loaded volume is dependent on the imported data it may not fully comply with reality. There may be multiple suppliers with different dimensions of the product packages which may conflict with the planned volume. Since only one supplier is listed in the imported lists it is not possible to report a fully true volume reference. Therefore some leeway is used in the colour coding. The colours are chosen based on a similar method for comparing the SSQ to the RSSQ in other IKEA software systems, this to make it familiar to the users since they are already familiar with the concept. Contrary to the wallbands and shelves configurations the volume bar is updated with every addition/removal of package from the section. The user can see the changes as they happen giving direct feedback of when the capacity is met/overloaded. This is thought to counteract the difficulties users reported in the initial survey regarding keeping SSQ to RSSQ and knowing how many packages fits on a section.

The right part of the main window contains a table view with the products on each shelf and on each rack. Using a dropdown list of all sections the user can pick a specific section or see the project overview of product placement. Only pertinent information is shown in the table to not overflow the user with unnecessary information. To adjust the quantity of a product for a specific shelf the user can do this with a spin box next to the article in the table view. Appealing to a GUI that the users are already familiar with at IKEA each article’s SSQ field is colour coded by the same colours and parameters as other IKEA software.
The user adds a product to the table using a 'Add Product' pop-up menu where the user can search for article numbers along a list of all products that are loaded into the application. If the user imported IKEA’s entire product range the dialog becomes a bit slow due to the vast number of articles in the product range. It is therefore possible to filter out one department (for example ‘rugs’) to display at a time. Learned from the initial survey was that keeping track of product TM was somewhat of a challenge for the planners. It is therefore possible to filter by TM in this view to start the planning with high TM articles and then finishing by adding low TM articles.

If the user wished more detailed information than the one presented in the main window table, it can be found in the ‘Add Product’ dialog. This is a way to provide the users of an alternative way to lookup multipack dimensions. It is thought to be easier to provide that information within the application and not forcing the user to step out of the application to find the information somewhere else and then return to the planning process. Keeping the user within the application is considered beneficial to the overall productivity and user experience by keeping the user within the same GUI at all times.

During the implementation process a continuous dialog was kept with the SSS specialist’s regarding progress, design and current focus. It was during these discussions decided to disregard the need for keeping track of article weight since it (based on their experience) in practice never is an issue. The sections are seldom close to being overloaded weight wise. Instead the focus was put on the visual representation of the sections and articles. In the original planning process the planner would by hand draw packages on a piece of paper with rack dimensions and in such a way determine how many multipacks would fit on a shelf/section. An experimental feature of drag and drop placement of packages onto the racking was therefore constructed. The drawing of each section in the main windows left side provides the user with the base sketch containing shelves and measurements. In the right section the user has a table with the selected products. The drag and drop placement feature enable the user to drag an article from the table and drop it onto one of the sections drawn to the left. From there the user can continue to rearrange the packages and by right clicking choose the size between consumer package, multipackage or full pallet. To differentiate between the packages in the drawing each article number is given a colour so that all packages of that
article have the same colour and the article number field in the table is coloured the same. To further deal with the problem of keeping track of multipack dimensions (highly rated in the initial survey) each package in the drawing has a tooltip that shows the article number and the dimensions of the chosen package type. This part of the application is in an experimental mode due to the difficulties of coordinating drag and drop into the already implemented drawing scene and handling all possible corner cases that can arise when a user freely can move around pieces of information in the GUI. Due to this the placement of the packages have no affect on the product quantities or the volume calculations. It is also possible to put packages on top of each other and above the maximum allowed product height. The feature is solely meant as an extra aid and visualisation tool for the user.

5 User evaluation

5.1 Practical tests

The intended users are sales co-workers of the IKEA Uppsala sales department, they all have in common that they are experts at the products they sell in their respective subdivision, i.e. lighting, decoration, rugs etc, and are therefore aware of how different products should be placed on the racking to make up a commercially appealing store. Since the different subdivision differ in their product selection different test cases were made up, one for each department so the users could pick one where they felt comfortable and familiar with the product selection. The test cases were taken from the actual IKEA Uppsala market hall by choosing a section of existing racking and compiling a list of the products placed there. Some products had more than one sales location and in this case the current SSQ was noted in the test material to inform the planner that he/she does not need to meet the full RSSQ but only a subset of it. Also included in the test material was the number of sections to be used (600 mm & 900 mm) and a max height for the products. This information was based on the current sales space setup.

To enable remote work (due to the Covid-19 pandemic some co-workers worked from home) a server was setup to which the users were given a personal login to access it via the internet. On the server the users had access to the application and all necessary data files (GADD lists and SSR) to be able to do the test from anywhere. The sales co-workers are in general busy with their day-to-day activities and to further make it easier for them to find the time to sit down and complete the tests, the help instructions were sent to each one along with an offer of a sit down to go through the basics of the application. It was thought to reflect a realistic workplace situation where the help documentation and personal help would be provided when introducing new software. According to the SSS specialists this is how new applications most often are introduced at the office.

5.2 Evaluation survey

After having completed at least one test case the users were given a survey to fill out. The survey was divided into three sections, first a section to determine if the application worked from a planning perspective, if it proved useful and how it compared to the current method. Secondly the UI was evaluated where the users would give their overall impression along with any features that stood out from the rest, both good and bad. Finally the users filled out some personal information such as experience in planogram planning and how they assess their ability to assimilate new computer software. The survey was anonymous to encourage truthful and detailed answers. All survey questions can be found in appendix B. Twelve people were asked to partake in the tests, two replied that they could not spare the time and out of the remaining ten, eight people took part in the testing and answered the survey.

One aspect of the success or failure of digitalising the planogram planning is the overall time consumption. It was assumed by the SSS specialists that a digital tool would prove to reduce the
A digital planning tool for sales racking overall planning time but also change how the planner utilises its time. The application would make the repetitive tasks of building racking and placing large quantity product easier. Leaving more time for adjusting SSQ to fit lower priority articles and solve the planogram in tight spaces with many products. During a conversation, regarding the purpose of the application, one of the SSS specialists involved with supporting this project summarised it with the following sentence: 

'If the application can solve 90% of the planogram planning faster and simpler than our current method it creates time to solve the last difficult 10%.'

Figure 8 shows the time consumption comparing planning with pen and paper against using the application. One respondent did not have a comparison reference and stated that he/she had not planned this type of sales racking before but other types at IKEA. Three respondents improved their planning time with the application while three were faster with pen and paper. The three who were slower with the application stated in their survey answers that they would like more time to get familiar with the UI and all of them were sure that with more practice they would pick up their speed. The overall impression of the time aspect is that using the application saves time when planning. The three respondent who were faster with pen and paper are also in the top four when it comes to experience of planogram planning in the market hall. This may further indicate that they have an efficient routine when it comes to planning and as they all stated they need some extra time to adapt their routine to the application. The less experienced co-workers were the ones who were faster when using the application compared to the current method. It indicates that it takes time to become efficient with the current method and by digitalising, the training time for new co-workers is reduced and the overall time spent on planning is reduced. Worth noting is that all respondents would like to use the application the next time they are tasked with planning sales racking.

![Figure 8: Time consumption of the different planning methods. Note that respondent nr. 5 did not have a reference with the old method and respondent nr. 7 answered 2-3 days.](image)

In the first survey that was sent to the co-workers they were asked to rank different aspects of planogram planning and racking construction based on their difficulty. The answers where then summarised and analysed in section 3.1 and worked as a way to prioritise the implementation. During discussions with the SSS specialists the 'Stay within racking max weight’ aspect was scrapped since it is rarely an issue in reality. In the evaluation survey the users were asked to rank to what extent the application aided them concerning these aspects. Figures 9 and 10 show the summarised answers. The general impression is that the four aspects in figure 9 were fulfilled to a satisfying level. The most divers aspect is 'Article priority with regards to TM’ where one respondent did not get any aid at all and one only got partial help. Section 4.2 explains how this is addressed using

---

1Conversation with IKEA Uppsala SSS specialist Clas Brännström (May 2021)
a filter when adding products and it is later shown in the product overview what TM each article is associated with. In retrospect it is not odd that at least one person did not get any aid when it comes to the TM priority, after reviewing the results it was noticed that a bug in the application listed all products with the same TM. However 75% of the users were largely or completely aided in this aspect which is interesting due to the nature of the bug. It is assumed that they noticed the feature but did not utilise the TM in their planning while the last 25% wanted to use the TM in their process but could not due to the bug and therefore responded as they did.

![Figure 9: To what extent the application aided the users with different aspects of the planogram planning.](image)

The two other questions where all answers were not strongly affirmative where 'Keeping SSQ to RSSQ' and 'Knowing how many multipacks fits on a rack'. A clear majority felt that the application helped them completely with keeping the SSQ to the RSSQ, two answered 'largely' and one 'partially'. The application displays the RSSQ (for products that have a RSSQ which all products selected for the tests did) and next to it the SSQ. Of course the program cannot create more space where additional products can be placed and if the respondent could not physically fit more products into the racking the respondent may have answered 'partially' or 'largely' depending on how the RSSQ's where met. But, as long as there is a RSSQ for a product then it will be displayed and the SSQ will be coloured in relation to the RSSQ which is considered the most help the planner can receive from the application. If there are products that do not meet their SSQ then it is something the planner must take into consideration and either, report to their superior requesting more space or a different location for those products or prioritise amongst the chosen products, perhaps with regards to TM.

'Knowing how many multipacks fit on a rack' got also more mixed responses and along with the answers to some free text survey question there is a pretty clear view of why. In the application products are added to a table where the section (rack) and shelf is specified. It is in that table the user alters the quantities of the products, the quantities are instantly reflected on a progress bar beneath each section that tells the user how much volume has been used of the available space. That functionality is sufficient to tell how many multipacks fit on a section. During the development it was highly requested to see the packets on the racking to give the user a visual representation of how the space was used. Placing packages on the drawing does not change the quantities since the feature got developed too late in the project to make it fully comply with all existing features. Based on some comments that is one clear factor to the responses. Another is that the application works in 2D giving the user the responsibility of determine how many packets
fit on the depth of the shelf. As an aid to the planner the application shows the size of the packet and the planner can see the depth of the shelf in the configuration menu but it is understandable that this is not sufficient for all users. As one user phrased it in their response it would make a huge difference if this process was simplified.

The respondents were also asked to rank different aspects of the racking construction, where the difficulty of each aspect could be considered either 'Very simple', 'Simple', 'Neither', 'Complicated' or 'Very complicated'. A summary of the respondents’ answers can be seen in figure 10. The overall impression of the answers is that the UI is considered simple or 'neither'. In this case 'Neither' is treated as an option where the task can be done without any difficulty and it is still not considered simple. For example, tasks that require several steps but where the different steps are laid out in a predictable manner which does not overly complicate things for the user. Interestingly creating the sections and the initial placement of the shelves was not met with any difficulty from the respondents. Configuring the sections and shelves where on the other hand considered more difficult where shelf configuration is labelled the most difficult task.

![Figure 10: The level of difficulty the users experienced concerning racking planning within the application.](image)

Configuring the sections are done via a pop-up window that is accessible by right clicking the section. The pop-up window contains six parameters that needs to be configured, five of the parameters have their name as a description for what they represent, left wallband height, left wallband foot etc, the sixth parameter is described via a tooltip and it is believed that the tooltip is missed by some users. While doing the application introduction with some of the respondents a recurring miss was the need to select the parameters for both the left and right wallband. The window could have been designed to further highlight the left/right side by for example adding frames around the parameters. Another recurring question was when the changes would be visible, as suspected in section 4.2.

The task that was considered the most difficult by the users was to configure the shelf parameters for an existing shelf. To edit a shelf the user must double-click on the shelf in the 'Configure shelves' dialog, edit the desired parameters and then press 'Update shelf'. To know that a shelf needs to be double-clicked to be edited is not intuitive and it is understandable that the respondents rated this task the most difficult. The help section covers this behaviour but in retrospect it might have been more user friendly to provide this information in the 'Configure shelves' dialog as a tooltip or plaintext in the window. The most intuitive way to edit the parameters would be for the user to simply edit the cells in the table that summarised all shelves, this was thought of but due to
technical difficulties abandoned for the current approach. As mentioned in the last paragraph and section 12, the new values of the shelves are not displayed until the pop-up is closed. During the application introduction this was considered annoying by multiple users when they edited the height of a shelf to comply with the height of a product. It led them to entering and exiting the editing menu multiple times and they all wished to see the changes as they happened. This was expected feedback and continuous to stress the importance of the user seeing consequences of their actions as soon as possible to gain an intuitive and positive user experience.

Several questions covered what the respondents thought of their interactions with the application. They were asked what their initial response was when opening the application, if the help section was helpful and complemented the UI, the chosen palette and usage of colours, features that stood out, the workflow and if different buttons and menus responded as expected.

Half had a positive initial reaction with the application where they thought it was simple to get started two others responded that they needed to go through the help section before getting started but after that there were no issues. That leaved two who responded that they thought their initial interaction with the application was complicated. All respondents considered the help section helpful and it helped them to get started and later throughout the use of the application, although two missed where to find it even though it was accessible from the start window and from the menu bar. A similar response was made when it comes to the expected response, all respondents thought the application responded as expected when the different buttons were clicked of values edited. Two respondents added that they needed more time to get adjusted to the application but also stated that it was not different from other applications they have interacted with in the past. A similar response was given to the question regarding the applications workflow, six respondents answered that they found a suitable workflow in the application, the seventh respondent stated that more time was needed to become efficient and the eight found that there was a bit too much jumping around in the application.

The respondents were also asked to bring forth any features that stood out as extra difficult along with a free text answer where they were able to bring forth any other comments about the UI. Considering the collective answers to these and other questions in the planogram section several respondents found it difficult or asked for a simpler way to add products to the shelves. Drag and drop functionality between sections were also asked for along with a way to get a 3-dimensional view of the racking and product packages. One respondent thought it was difficult to load the required data files, the GADD lists and SSR. The testing environment was setup on a computer with a Xfce4 desktop environment which may have looked strange to users familiar with Windows since the file dialogues are different.

In the final section of the survey some personal information was sought from the respondents. For example, their experience with planogram planning, both in the market hall and in other sale spaces, and a self-assessment on how easy they adapted to new computer software. Other than what has been discussed when presenting the time aspect there was no correlation between the planners’ experience and the other answers to the survey. Neither when it came to the planogram process or the UI. The self-assessment connected to adapting to new software did not present any trends when connected to the other questions about UI or UX. On a scale from 1 (very difficult) to five (very easy) the users responded: [2, 3, 3, 3, 3, 3, 4, 4] and when connecting these numbers to the rating of difficulties in the application and considering free text feedback of functionality, UI and UX there was no correlation. In other words, the respondents who rated a 4 did not deviate any more in the questions than the one who rated a 2. It was expected to see some more deviation in the respondent’s answers but in retrospect from a one question self-assessment it may have been wishful thinking and the users should have been asked multiple questions connected to different aspects of software.
6 Discussion

6.1 Surveys and user feedback

The overall feedback for the application was positive showing that the co-workers have been longing for a digital tool for planogram planning and that the application helped them in their work. All who responded to the last survey stated that they would like to use it again for their next sales rack planning. It also showed that the time for beginners was reduced when using the application instead of the current pen and paper method. Based on the answers in the first survey and the discussion that followed with the SSS specialists the development took a slight wrong turn and looking back the priorities should have been different. During the initial discussions the need for a graphical view of each individual package was not thought as important and a tabular view of the products’ quantities at each shelf would be sufficient. Later on during a demo for the SSS specialists it was revealed that the graphical view was indeed very important and possibly more important than the tabular view. In the first survey this question was asked to all the respondents and the answer came back 50/50. Since the decision was important for the technical implementation as well as the users UX and the applications success more should have been done in an early stage to drill down to what the users really wanted. For example a few complementary questions with some conceptual images of the different approaches could have been sent to the respondents of the first survey as a way to give them the ability of making an informed decision. This feature was introduced for the user tests and final survey but in an experimental version meaning that it did not have any impact on the product quantities, it only worked as a graphical aid for the planner. In the final survey the most common feedback from the users was more drag and drop functionality and easier product placement. The users asked for the ability to drag and drop packages on the racking and move it around in a dynamic way while it made impact on the product quantities. In addition to drag and drop the initial placement of products was asked to be simpler. By foregoing the need to add each product to each shelf where it is supposed to be located in the table form a single placement on the canvas could have sufficed so that the user can drag around the product packages between sections. Based on the survey answers this would probably lead to a better UX, simpler UI and lower planning time. Additionally if this approach was taken from the start the technical implementation may have been easier since there would not have been a need to keep track of each article on shelf/section. A problem would remain even with this setup, that is planning in depth. With a 2D application there would either be a need to switch the view from front to side or top view to get a clear picture of the space utilisation or convert everything to 3D. From a planning perspective it would probably be easier to get a full grasp of the space by working in a 3D environment but it would also create more technical challenges in rendering the racking and product packages.

At the beginning of this thesis project it was intended to contain three surveys and two user evaluations. The first survey would be the same as the one presented in this report, collecting the users wishes and priorities regarding the process and UI. When a stable version of the application was ready there would be a smaller user test and a following survey where the functionality and UI was evaluated. New conclusions where to be drawn from that survey guiding the development to the final tests and survey. Then the application would be finished and properly evaluated. If the time and resources would have been available at IKEA Uppsala a group made up of new co-workers who had not done planogram planning before would start by learning the current method, evaluate it for a couple of test cases and then use the application for the same test cases. This would make for a proper evaluation of both how the application impacts the planning process and show potential gains, such as time spent on training and commercially appealing sales racks, but also on the UI and UX since the test users would be completely fresh when it comes to planogram planning and the application (since they would not have been part of any previous surveys or tests). Unfortunately reality caught up with the plans, technical difficulties combined with personal absence prolonged
the first development stage of the application making it the only development. The indented middle survey and test were scrapped in favour of completing the application and performing the final tests. To have some form of compensation for the missing survey more continuous demos were held for the SSS specialists where the applications functionalities were discussed more in detail than they were previously meant to be.

6.2 Technical discussion

Choosing Python and PyQt as a platform for the development showed to provide a lot of technical possibilities along with extensive online documentation for the PyQt5 framework. Initially the data was kept as Pandas dataframes but during the development they showed to be very slow making the application freeze from time to time. They were exchanged for Python’s dictionary which then functioned as the primary data structure for the application. The application was intended to be a desktop application run locally on IKEA computers, but due to the Covid-19 pandemic it was necessary to enable it for remote work via the internet. The result was an Apache Guacamole[7] powered remote desktop connection via the web browser to a computer running the desktop application. An interesting approach would have been to construct the application as a web application from the beginning, efficiently making it adapted for remote work as is and possibly making it easier to introduce onto the IKEA work stations.

During the early development when the racking was constructed a decision was made to only update the graphics when the configuration dialogues were closed and not as the different values where altered. The decision was made to make the technical implementation easier but with the transition to dictionaries and the obvious UX flaw (as discussed in sections 4.2 and 5.2) signals should be introduced to update the graphical drawing as the different parameters are changed providing instant user feedback. Initially it was thought that too many updates to the graphical view would slow down the application but later on it was discovered that this did not make a noticeable impact on the GUI and a method was developed to keep the number of updates down. The method consisted of each section keeping track of all product packages placed within its borders. When a package was updated (moved, rotated etc.) a signal was sent to only update the package. This was possible by representing each package as a QLabel[8], an individual object, instead of permanently drawing it on the section. When this approach was taken there was little to no time left to make any major changes to how the racking was drawn. An idea was had where each shelf, wallband etc would be represented as a QLabel instead of being explicitly drawn on the section. Connecting the draw method with a signal that would fire when a change had been made it would be possible to see changes as they happen, just as it was asked by the respondents of the final survey.

Since the respondents focused on drag and drop features and a dynamic way of constructing the section/racking the section layout should be redone to accept the drag and drop of section. It currently uses the PyQt5 vertical QBoxLayout[9] meaning that all new sections will be added to the far right and it is not possible to insert or move them anywhere else. By constructing a custom layout with another underlying data structure, a tree for example, it would be possible to construct methods for popping and inserting sections at a desired location meaning that the user could move around sections or add new ones in the middle of an existing build. This could be highly beneficial if the user tries out different section layouts or simply forgets to add a gap/section when doing the initial planning.

7 Conclusion and future work

It has been concluded that the current planogram planning method at IKEA Uppsala is slow, difficult to learn and prone to error. This indicates that there is a need for change, it should not take tens of years to become an efficient planner since sale spaces need to be adjusted on
a monthly basis due to the ever-changing sales forecast. Within the scope of this thesis project a survey was sent to co-workers at IKEA Uppsala who engage with planogram planning with a request for input regarding their thoughts of the current method and a proposed application to aid them in their work. In co-operation with the SSS specialists the application was then developed and evaluated by the co-workers who planned a sales space using the application and then filled out an evaluation survey. The application developed aided the planner in dynamically constructing sales racking, keeping track of the size of product packages, RSSQ and TM using a slimmed UI which was considered appealing and simple to get started with. The main concerns about the application were the editing of previously placed racking and the placement of products. During the development the focus of the application shifted over time from a tabular based tool leading towards a more graphical drag and drop interface. These changes where started on too late in the development process to properly address these issues. The final survey gave a clear view that the planners wished to drag and drop product packages in favour of altering quantities in a table view. Even with this feedback from the co-workers their overall assessment of the application was positive, it aided them in their work and they would all like to keep using it for their future projects. For future development of this or a similar tool the results presented in this survey can function as a stationary point of which the next step would be to address the results of the users evaluation.

To summarise, this study has shown that a digital tool makes the planning process simpler by reducing the number of parameters the planner needs to keep track of. Indicating that investing in a digital tool for market hall racking planning will pay off in terms of time spent and the precision of the planning. There are several planogram planning tools available on the market but none of them is out of the box compliant with IKEA racking and product information. It is doubtful that the low-cost alternatives fully will suffice for the planning and the full-scale solutions would probably be too expensive and difficult for a single store to integrate with the current IT systems. Therefore, if the full-scale solutions are to be investigated further it should not be on a single store but done at least on a national level by IKEA’s national support element, the service office.
References


A Survey 1
Litterering

Programmet är endast tänkt att hantera racking för 60/90 sektioner med olika typer av hyllor och fötter.

Bakgrund
Lite bakgrund till det initiala skedet i litteringen som står utanför vad litteringsverktyget kommer assistera med.
* All artikelinformation kommer importeras som xlsx filer genom utdrag ut GADD.
* Information om tillgänglig racking med dimensioner mm. är baserad på en broschyr från IKEAs intranät.
* Informationen du som literator behöver ta reda på innan du påbörjar är:
  - Hur stor yta du har till ditt förfogande.
  - Vilken racking som fysiskt finns tillgänglig vid ombyggnaden.
  - Vilka produkter som är tänkta att varuläggas på hyllorna. Programmet kommer kunna hjälpa till att varulägga produkter inte att välja ut produkter.

1. Nedan följer olika moment i littereringsprocessen, ranka dem i den ordning du tycker de är svårast att hantera när du literator:

   * Mark only one oval per row.

<table>
<thead>
<tr>
<th>Ha koll på multipackstorlek (bredd x längd x höjd) för alla produkter</th>
<th>Viktiga artiklar är prioriterade enligt TM, (high, medium eller low article Turnover Margin)</th>
<th>Storleken på säljytan så att den inte är för liten/stor mot RSSQ</th>
<th>Inte överskriva maxvikt på hyllplanet</th>
<th>Hur många multipack som får plats på en hylla.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Svårast)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 (enklast)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

https://docs.google.com/forms/u/0/d/1e7kJG054KxRzd...
2. Är det någon del i littreringen, utöver de som var i frågan ovan eller i bakgrundsinformationen, som du tycker är svår eller viktig och vill därför lyfta fram?


Mark only one oval per row.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Viktigast)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

4. Är det någon del i val av racking, utöver de som var i frågan ovan, som du tycker är svår eller viktig och vill därför lyfta fram?


Mjukvara

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th>Ha koll på multipackstorlek (bredd x längd x höjd) för alla produkter</th>
<th>Viktiga artiklar är prioriterade enligt TM, (high, medium eller low article Turnover Margin)</th>
<th>Storleken på säljytan så att den inte är för liten/stor mot RSSQ</th>
<th>Inte överskriva maxvikt på hyllplanet</th>
<th>Hur många multipack som får plats på en hylla.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>(Mest hjälp)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>(Minst hjälp)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

6. Är det någon annan del du vill ha hjälp med? Har du övriga kommentarer?

---

---

---

---
7. Spelar programspråket någon roll för dig?

*Mark only one oval.*

- Jag föredrar program på svenska
- Jag föredrar program på engelska
- Nej, svenska eller engelska spelar ingen roll

**Användargränssnitt**

Det grafiska användargränssnittet i programmet kan vara utformat på olika sätt. Nedan följer några frågor för att få en uppfattning om vilket utförande som kan vara till störst hjälp i littersprocessen.

8. Vill du kunna lägga till racking sektioner/hyllplan under tiden du lägger in varor eller bygga hela racket först?

*Mark only one oval.*

- Jag föredrar att bygga hela racket och sätta dit alla hyllplan först, innan jag lägger dit varor.
- Jag vill bestämma antalet sektioner innan jag börjar planera men vill ha möjlighet att lägga till/ta bort hyllplan under tiden jag lägger dit varor.
- Jag vill kunna lägga till/ta bort både sektioner och hyllplan under tiden jag lägger dit varor.

9. Det är viktigt för mig att se var varje multipack ligger på hyllplanen.

*Mark only one oval.*

- Jag vill kunna markera ett hyllplan och placera varje multipack av respektive produkt för hand precis där jag vill ha dem.
- Det räcker om jag bara kan fylla i hur många multipack av respektive produkt som ska ligga på ett hyllplan.
10. Hantering av SSQ

*Tick all that apply.*

- Jag vill att programmet varnar om jag lagt en för liten eller för stor yta jämfört med RSSQ.
- Jag vill kunna lägga in en SSQ manuellt.
- Jag vill inte få några varningar om RSSQ.

11. Hur vill du att den planering du gjort i programmet ska sparas?

*Tick all that apply.*

- Jag vill kunna skriva ut en bild på racket där det står vilken typ av hyllor som sitter var.
- Ett excel ark med detaljer kring vilka produkter som ska varuläggas på respektive hyllplan och deras kvantitet.
- Jag vill kunna spara det arbete jag gjort och återuppta det vid ett annat tillfälle.
- Det är inte viktigt för mig att kunna återuppta arbetet senare, jag börjar hellre om från början.
- Jag vill kunna skriva ut en bild på racket där man inte bara set de olika hyllorna utan även vilka produkter som är varulagda på respektive hylla.

12. Är det något annat du vill lägga till, önskemål eller liknande om vad du förväntar dig av ett litteningsverktyg?

________________________________________
________________________________________
________________________________________
________________________________________

**Personlig bakgrund**
13. Hur lång erfaranhet har du av att lättra racking i saluhallen? (tiden det varit en del av dina arbetsuppgifter)

Mark only one oval.

- < 1 år
- 1 - 3 år
- 3 - 9 år
- > 10 år

14. Hur enkelt tycker du det är att lättra med nuvarande metod?

Mark only one oval.

1 2 3 4 5

Väldigt enkelt ☐ ☐ ☐ ☐ ☐ Väldigt svårt


________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

16. Har du lättrat butikshyllor utanför IKEA?

Mark only one oval.

- Ja
- Nej
17. Om du litterat utanför IKEA, var den erfaranheten till någon hjälp när du började liltrera på IKEA? Svara 'Ja'/Nej' och utveckla gärna.

18. Om du liltrerat utanför IKEA, använde du någon särskild mjukvara för det?

19. Är det något annat du vill lägga till angående din erfaranhet kring liltrering?

Tack för din medverkan!
Svaren från denna undersökning kommer sammanställas och tillsammans med tekniska begränsningar ligga till grund för hur liltreringsverktyget kommer att vara utformat.

This content is neither created nor endorsed by Google.
B  Survey 2
Littreringsverktyg enkät 2


*Required

Litttering

1. Kunde du littrera dina sektioner så att SSQ uppfyller RSSQ för samtliga produkter samtidigt som sektionerna inte överskreds i volym? *

   

2. Ungefär hur lång tid tog litteringen? *

   

3. Ungefär hur lång tid brukar littreringen ta med den metod du brukar använda? *

   

Littreringsverktyg enkät 2 https://docs.google.com/forms/u/0/d/1xO5B3JQ9ZfE7w...
4. Hjälpte programmet dig med något av följande aspekter? *

Mark only one oval per row.

<table>
<thead>
<tr>
<th></th>
<th>Nej inte alls</th>
<th>Till viss del</th>
<th>Till stor del</th>
<th>Ja helt och håller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ha koll på multipackstorlek (bredd x längd x höjd) för alla produkter</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Viktiga artiklar är prioriterade enligt TM, (high, medium eller low article Turnover Margin)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Storleken på säljytan så att den inte är för liten/stor mot RSSQ</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Hur många multipack som får plats på en hylla.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
5. Hur upplevde du följande aspekter av att bygga racking i programmet? *

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th>Väldigt enkelt</th>
<th>Enkelt</th>
<th>Varken enkelt eller komplicerat</th>
<th>Komplicerat</th>
<th>Väldigt komplicerat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skapa nya sektioner</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Bestämma sektionernas mått (bredd och höjd)</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Placera hyllor i sektionerna</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
</tbody>
</table>

6. Saknade du något stöd av programmet?

---

Litteringsverktyg enkät 2
https://docs.google.com/forms/u/0/d/1xO5B3JQ9ZfE7w...
7. Skulle du kunna tänka dig att använda programmet igen vid nästa littering? *

*Mark only one oval.*

☐ Ja
☐ Nej
☐ Other: ____________________________

8. Är du mer benägen att delegera litteringsuppgifter till kollegor/medarbetare om de kan nyttja programmet istället för den nuvarande metoden med papper och penna? *

*Mark only one oval.*

☐ Option 1
☐ Nej
☐ Other: ____________________________

9. Är det något du vill tillägga angående litteringsprocessen?

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

Användargränssnitt

10. Vilket var ditt första intryck när du startade programmet? *

__________________________________________________________________________

11. Hjälpte 'hjälp sektionen' dig att komma igång?

__________________________________________________________________________
12. Var det några delar i applikationen som verkade som stack ut och upplevdes som extra krångliga? *


14. Var färgsättningen tilltalande eller upplevde du att den påverkade ditt arbete?

15. Gav applikationen dig den respons du förväntade dig när du tryckte på knappar/justerade antal eller liknande moment? *

16. Är det något annat du vill berätta om hur du upplevde applikationen?
Personlig bakgrund

17. Hur lång erfaranhet har du av att litemera racking i saluhallen? (tiden det varit en del av dina arbetsuppgifter) *


19. På en skala från 1 (Väldigt svårt) till 5 (välldigt lätt) hur lätt anser du dig själv ha för att ta till dig nya datorprogram? *

Mark only one oval.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Väldigt svårt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Väldigt lätt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tack för din medverkan!

Svaren i denna enkät kommer analyseras och ligga till grund för den analytiska delen av mitt examensarbete. Stort tack för att du tagit dig tiden att hjälpa mig ta examen!

This content is neither created nor endorsed by Google.