Medexter Healthcare

ZK is used in Medexter's software MOMO (Monitoring of Microorganisms), a microbiology analytics and clinical tool for hospitals and in order to monitor pathogens and antimicrobial resistances. The software can play an important role in avoiding the occurrence of epidemics inside a medical institution and helps medical personnel with prescribing adequate antibiotics while battling multi-drug resistant bacteria.

About Medexter

Located in Vienna, Austria, Medexter Healthcare develops and markets knowledge-based systems for clinical decision support. The aim of these high-tech software solutions is to promote quality assurance and patient safety in diagnosis, therapy, prognosis, and patient management.

ZK x Clinical Decision Support

We currently use ZK in 3 of our software projects:

ArdenSuite Server – The ArdenSuite clinical decision support (CDS) technology platform aims at providing clinicians and other medical personnel in a hospital with highly efficient medical-knowledge-based support in their daily decision-making processes. Its CDS is patient-specific, as it is based on a person's latest data. The software based on this standardized syntax is applicable in every medical discipline. Initially without specific clinical content, it represents a highly flexible and versatile platform, waiting to be applied to medical tasks or to solve specific clinical problems, when endowed with proper clinical knowledge. The ArdenSuite's components comprise the ArdenSuite IDE for content development and testing, the ArdenSuite Server for content management and processing, and our ArdenSuite Connectors and Extensions for interfacing.

MONI (Monitoring of nosocomial infections) is an intelligent tool for detection and surveillance of healthcare-associated infections (HAIs) in intensive care medicine. It is linked with the medical documentation systems of a healthcare institution and automatically imports electronic clinical and laboratory raw data to process it into surveillance information. MONI thereby allows to identify and monitor healthcare-associated infections without the need for extra data entry by medical or surveillance staff. Due to the integration of fuzzy concepts, MONI also captures those incipient or borderline cases that are normally at a risk of not being recognized.

We are currently developing a new MOMO release and have been adding features and components for the last few months.

The Project

MOMO (Monitoring of microorganisms) is a microbiology analytics tool with a strong clinical feature. MOMO's QuickScan functionality gives immediate single patient overviews with all or all positive, approved results for one patient. It serves as a fast clinical tool for the attending physician and is always up-to-date. As microbiology analytics software, MOMO provides all the information on pathogen occurrence, frequency distribution, and resistance situation in one place. 58 different parameters allow maximum flexibility for clinical, QM, and administrative queries. User-defined templates facilitate reporting and benchmarking.

The Challenge

MOMO is a software that is intended to be used in clinical practice by physicians. It comprises a combination of features used individually or combined by physicians and medical personnel of different disciplines and with different purposes or problems in mind.

We rely heavily on our users' feedback and requests for needed features and extensions. As these users are mostly doctors and other medical personnel, issues are often complex and connected to the well-beeing of actual patients.

This implies that we must be able to implement new features exactly as needed and also customize the user interface to our users' liking. Our GUI components have to be clean and easy to grasp, and the system's performance has to be satisfying for use in clinical routine. Also, it has to be possible for us to make quick and effective adjustments.

Why ZK

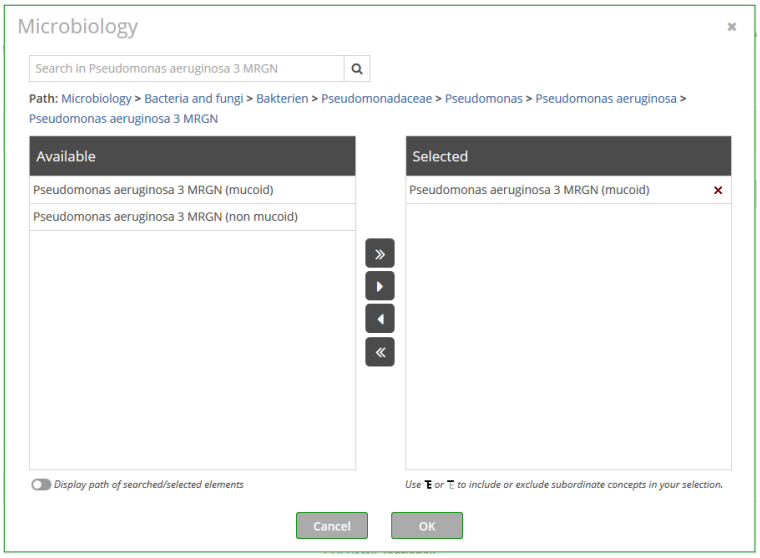
We chose ZK as our framework, because while it leverages the strengths of AJAX, the developer usually does not have to deal with JavaScript but can concentrate on programing in Java. Furthermore, themes provided by ZK can easily be adapted to our own requirements, which leads to highly customizable user interfaces.

We consider the development of customized components a particular benefit. ZK components already provide great functionalities, but for medical contexts and purposes, we were forced to create some components ourselves. We, for example, created components in order to provide users with a tool to create customized queries and select items from a thesaurus containing pathogens.

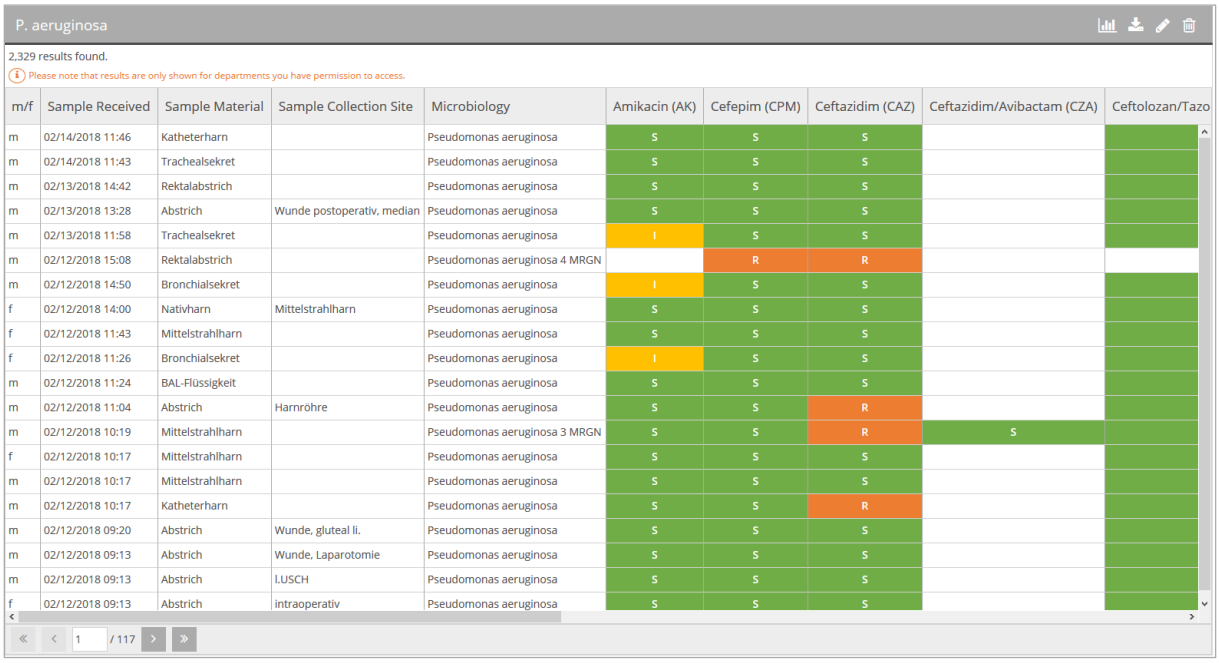
Furthermore, ZK's support team responds very quickly, always provides helpful advice, and informs about the resolution of bugs within ZK.

The Result

A particularly needed feature, for example, was the possibility to quickly choose items from a thesaurus (we have 4 thesauri: pathogens, sample material, departments, and antibiotics) while configuring a FlexScan query. We implemented it as follows:



When defining a so-called *FlexScan* query, users can choose and combine 58 different clinical and laboratory parameters (including the above-mentioned thesaurus-based parameters). The result can look like this:



P. aeruginosa

2,329 results found.

Please note that results are only shown for departments you have permission to access.

m/f	Sample Received	Sample Material	Sample Collection Site	Microbiology	Amikacin (AK)	Cefepim (CPM)	Ceftazidim (CAZ)	Ceftazidim/Avibactam (CZA)	Ceftolozan/Tazo
m	02/14/2018 11:46	Katheterharn		Pseudomonas aeruginosa	S	S	S		
m	02/14/2018 11:43	Trachealsekret		Pseudomonas aeruginosa	S	S	S		
m	02/13/2018 14:42	Rektalabstrich		Pseudomonas aeruginosa	S	S	S		
m	02/13/2018 13:28	Abstrich	Wunde postoperativ, median	Pseudomonas aeruginosa	S	S	S		
m	02/13/2018 11:58	Trachealsekret		Pseudomonas aeruginosa	I	S	S		
m	02/12/2018 15:08	Rektalabstrich		Pseudomonas aeruginosa 4 MRGN		R	R		
m	02/12/2018 14:50	Bronchialsekret		Pseudomonas aeruginosa	I	S	S		
f	02/12/2018 14:00	Nativharn	Mittelstrahlharn	Pseudomonas aeruginosa	S	S	S		
f	02/12/2018 11:43	Mittelstrahlharn		Pseudomonas aeruginosa	S	S	S		
f	02/12/2018 11:26	Bronchialsekret		Pseudomonas aeruginosa	I	S	S		
m	02/12/2018 11:24	BAL-Flüssigkeit		Pseudomonas aeruginosa	S	S	S		
m	02/12/2018 11:04	Abstrich	Harnröhre	Pseudomonas aeruginosa	S	S	R		
m	02/12/2018 10:19	Mittelstrahlharn		Pseudomonas aeruginosa 3 MRGN	S	S	R	S	
f	02/12/2018 10:17	Mittelstrahlharn		Pseudomonas aeruginosa	S	S	S		
m	02/12/2018 10:17	Mittelstrahlharn		Pseudomonas aeruginosa	S	S	S		
m	02/12/2018 10:17	Katheterharn		Pseudomonas aeruginosa	S	S	R		
m	02/12/2018 09:20	Abstrich	Wunde, gluteal li.	Pseudomonas aeruginosa	S	S	S		
m	02/12/2018 09:13	Abstrich	Wunde, Laparotomie	Pseudomonas aeruginosa	S	S	S		
m	02/12/2018 09:13	Abstrich	I.USCH	Pseudomonas aeruginosa	S	S	S		
f	02/12/2018 09:13	Abstrich	intraoperativ	Pseudomonas aeruginosa	S	S	S		

1 / 117

An important feature of MOMO is the AMR query. Clinicians select a pathogen based on a FlexScan or QuickScan query and MOMO graphically displays the relevent antimicrobial resistance (AMR) situation for this pathogen:

	Amikacin (n=116)	Cefepim (n=144)	Ceftazidim (n=144)	Ceftazidim/Avibactam (n=95)	Ceftolozan/Tazobactam (n=116)	Ciprofloxacin (n=144)	Colistin (n=93)	Gentamicin (n=116)	Imipenem (n=144)	Meropenem (n=144)	Piperacillin (n=144)
Resistant	18.96%	76.39%	76.39%	28.42%	20.69%	60.42%	2.15%	36.21%	76.39%	79.86%	97.22%
Intermediate	16.38%	0.69%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.17%	7.64%	0.00%
Sensitive	64.66%	22.92%	23.61%	71.58%	79.31%	39.58%	97.85%	63.79%	19.44%	12.50%	2.78%

Future

We are looking forward to using the latest release of ZK as it contains major improvements regarding the design of certain components in different browsers. Moreover, we are currently evaluating *ZK Charts,* as it seems to allow the creation of more sophisticated charts, which we will need in planned features in order to fulfill the clinicians needs.