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Development of a Research Tracking System for Higher Education Institution Research Grants

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Abstract

This paper presents an overview of the processes and tools governing the research administration in Higher Education Institutions (HEIs) in general and Qatar University (QU) in particular. It also encompasses the best practices being employed or to be adopted for smooth sailing of research projects all the way from their inception to closeout. It can serve as a referring point for management to get an eagle view of the present research policies and accordingly take decisions to boost the quality of research outcomes by implementing automated systems such as tracking and monitoring of research activities to tackle the grants in a more effective and productive manner. Moreover, the requirement of a research tracking system (RTS) has been emphasized by proposing a stepwise implementation to manage grants more efficiently both from an administration and management point of views.

In order to detail the implementation of RTS, a brief review of contemporary available grant management systems, applicable to research, has been conducted. The salient features of these systems are studied to develop an in-house solution for the university in the form of web applications using open-source tools. A tailored tracking and monitoring of research activities, from post-award until the closeout of the grants, is a valuable addition that contributes to building best practices for higher education and research institutions.

The system digitally registers the growth of the university awarded grants, in terms of research outcomes. It will intimate the projects' leaders of their present performance with respect to their peers. The Office of Research Support (ORS) of the university on

the other side can track such progress and make informed decisions to improve the performance of its grants.

1 Introduction

Qatar University (QU) launched a new division within the research office in 2006 (later restructured and rebranded as Office of Research Support or ORS) to effectively manage research grants and to better support students and staff. Research and development need a strong base of education and policies. Since its inception, the new division followed in its operations international standards and globally well-accepted best professional practices (Tufeanu et al., 2019). The administration offices provide the services necessary to carry out research activities within an organization. This involves introducing new research programs, pre-screening, and evaluating proposals, supporting the hiring of researchers and equipment for the awarded grants, and providing administrative and financial services until the closeout of the projects (Al Ali Al-Maadeed et al. 2021). Figure 1 shows the workflow of operations managed by ORS through its three departments: Pre-Award, Contracts & Compliance, and Post-Award.

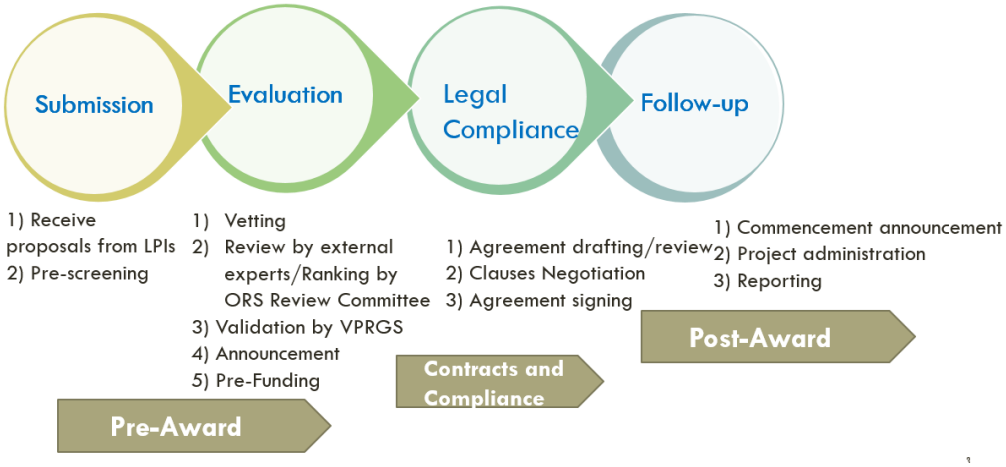


Figure 1: Overall workflow diagram within ORS at QU

As an example, Figure 2 hereunder details the services flowchart of one of the departments of ORS. The Post-Award department is responsible for monitoring the progress of the grants, gathering progress & final technical reports, and other important key performance indicators prior to the closeout of the awarded grants.

In order to administer and manage research activities, adopting appropriate tools, software, and even in-house solutions look tedious on one hand but simplify the complex tasks manifold on the other hand if used with clarity in their scopes.

The mandatory tools to assist administration and management staff can be divided into two main categories. The first category includes the tools to execute financial transactions related to research projects and can be considered mandatory because accurate handling of financial transactions and budgets pertaining to projects cannot be neglected. The second category involves the management tools such as online platforms for submitting, evaluating, awarding, and tracking of research projects. Several

tools are being employed at QU by ORS for financial transactions (Oracle Grants Accounting), submission and evaluation of research proposals (iGrants), human resources, student management systems, etc. Such platforms support ORS staff to streamline the research proposals and budgets; however, the scrutiny of the grants' applications and the tracking of their progress during the projects' lifecycle requires additional tools to be deployed.

In this paper, the requirements, and best practices of tools for the tracking of grants' progress will be covered in addition to the discussion of features of similar products available in the market that are being widely adopted by the research organizations. Firstly, the process flow diagrams of ORS including its departments will be explained to conceptualize the global picture of the grant's lifecycle. It will then be proceeded by the contemporary grant management tools being widely used. Finally, the design and implementation requirements of an in-house solution named RTS will be concluded in the light of features available in present grant management tools in the market and specific requirements of QU research office.

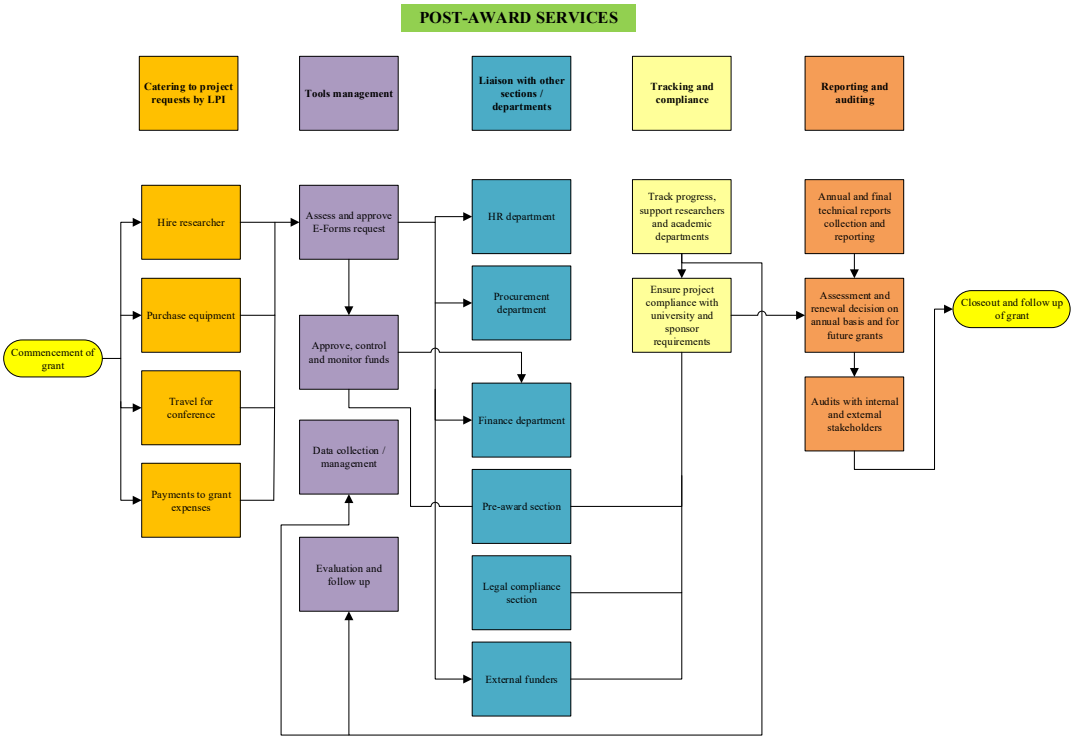


Figure 2: Flowchart of Post-Award services.

2 Features of contemporary grant management tools

Several tools for grant management are available on the market and benchmarking of these tools can help understanding the features required for the RTS intended for the tracking and reporting the progress of university grants. These tools present some or part of the following salient functional features:

- Capture and reuse data
- Validate and certify data
- Profile researchers
- Identify experts and funding
- Report on everything
- Analyze and track research progress
- Showcase and collaborate

The use of social networking can work wonders in lifting up the research profile of an organization (Bixler et al. 2019) and such tools can be very productive in attaining this objective. Their pricing information is mostly quotation-based from the authorized vendors. Most of the tools possess standard web application features such as:

- Highly customizable forms
- Multimedia uploading
- Response sheets with bulk send
- Integration to third party analytical platforms
- Real-time monitoring
- Centralized dashboard
- Role-based permissions
- Notifications alerts

Table 1 summarizes a few selected existing grants' management solutions and their focused features.

Grant Management Tools	**Features**
Submittable	▪ Proprietary, ▪ Editable forms using add/drop functions, ▪ Upload videos, images, and files, ▪ Response templates with bulk send, ▪ Role-based access, ▪ Integration with third-party applications
PeopleSoft Enterprise Grants Management	▪ proprietary, ▪ web based, ▪ handles entire life cycle of research management, ▪ centralized budget management, flexible billing and reporting, efficient award administration and real time cost visibility
CyberGrants	▪ Proprietary, ▪ Cloud based, ▪ Tax ID checking, accounts integration with payable systems, data scanning against watch lists, reporting automation and automation of communication with grant seekers, ▪ Highly configurable dashboard,

	▪ Calendars, payroll solutions and social media platforms, ▪ Role-based access
Sage Intacct	▪ Proprietary, ▪ Cloud-based financial management tool, ▪ Purchasing, accounting, cash management, subscription billing and consolidation ▪ Tracking, real-time visibility, and advanced reporting capabilities, ▪ gets rid of duplicate data entry and track critical operational metrics
Fluxx.io	▪ Proprietary, ▪ Fields, workflow controls and forms, ▪ Comprehensive audit trails, session timeouts, ▪ Report Builder, Excel, and Word plugins, ▪ Track investments and grant-by-grant analysis
Versaic	▪ Proprietary, ▪ Handles all areas of grant management, ▪ Automates, configures, and streamlines processes ranging from vetting, review to approval and payment processing, ▪ Fewer manual data entry and report in real-time
Altum Grants Management	▪ proprietary, ▪ Handles all areas of grant management, ▪ Automate processes, transparent and consistent while reducing cycle times ▪ Minimize staff turnover impact and ensure compliance, ▪ Works two-way for both Grantmakers and grant seekers
Grantium	▪ Proprietary, ▪ Popular for cost-efficiency, flexibility, and cloud-based, ▪ Handles all phases of the grant, ▪ Robust reporting capabilities, ▪ Application and approval automation, provision of a common language and approach to grant management projects, and automated reminders of team members of their grant assignments
OpenWater	▪ Proprietary, ▪ Manages the entire life cycle of grant, ▪ Application collection, review, to follow up, ▪ Boost non-dues revenue, improve membership value and focus on core processes, ▪ Directs applicants to a specified submission page and not a third-party site, ▪ Customized messages,

	▪ Online forms, letter of reference compatibility, email confirmations, and branded website
Grants Manager Plus	▪ Proprietary, ▪ Makes grant discovery effortless by automatically detecting grants that fit your specifications, ▪ Identify qualified grant applicants, centralize all records and information, send notifications on upcoming events and deadlines

Table 1: Selected grant management tools for benchmarking from *financesonline.com*

3 Research Tracking System (RTS

The developed system should be able to evaluate the progress of the grants based on pre-defined rubrics. Once evaluated, each grant will be scored and even be assigned a color code in order to facilitate decision making for ORS team for annual renewals of grants in addition to supporting in the pre-award phase for pre-screening and evaluation phases of grant proposals. The tracking system can be referred to make decisions for granting future awards based on successful completion of past projects as evaluated and scored by RTS.

Therefore, the rubrics which will be used to evaluate and score grants by the RTS will be for internal and official use only to effectively monitor and report the progress throughout the life cycle of the project. These include the following:

1. Scholarly Outcomes: scores both quantity and quality of the publications (journal, conference, book, patent, etc.) resulting annually and at the end of the grants.
2. Funding Size: gives points depending upon the size of funding secured in the case of industrial and external grants.
3. Academic Contributions: basically provides scores based on the qualification and skill set levels of the researchers (undergraduate, Masters, Ph.D. students) involved in the project team.
4. Reporting Management: gives negative scores for missing deadlines, late submissions, and underachieving the objectives set for publications or hiring specific team members.
5. Research Misconduct tracking: provides a follow-up of the misconducts and their qualification as either isolated events or part of a pattern, preventing significant impact on the research record, researchers and institutions (following the policy's guidelines of our main external funding agency (QNRF, 2022).

3.1 The Architecture of Research Tracking System (RTS)

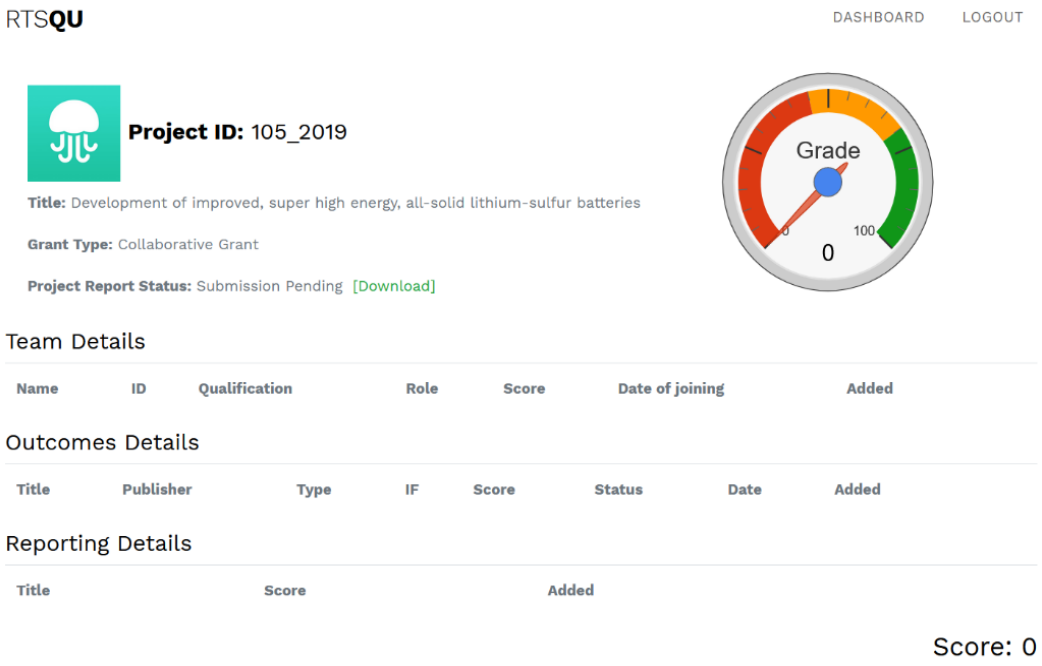
RTS uses three-tiers architecture and consists of web graphical interfaces, based on dynamically accumulated information from current grants (per cycle, type, college, center, pillar, collaboration, and outcomes). The implementation of RTS is achieved according to the following steps:

1. Developing a database (MySQL), a server (PHP), and a client (HTML/CSS/JavaScript) for the RTS with a limited user group based on the rubrics to evaluate.
2. Developing role-based features for the web application, mainly lead principal investigator (LPI) and ORS users in this context
3. Launching the web application online inside QU network.

4. Providing access to the limited users to use the web application and collection of their feedback.
5. Troubleshooting the problems and enhancing the network to include all potential users.

RTS is intended for three types of users: LPIs, Colleges/Centers, and the ORS. ORS is privy to information on all grants visible or submitted by LPIs. For administration purposes, features such as email notifications to LPIs and extension of deadlines for grants are available. The College/Center interface is basically a subset of ORS with the difference that ORS includes the administration of the whole university while College/Center is restricted to the specific academic unit. The LPI interface is designed to update required information about the active grants awarded to the LPI and let her/him be aware of the performance achieved in those grants.

A sample of interface is depicted below in Figure 3.



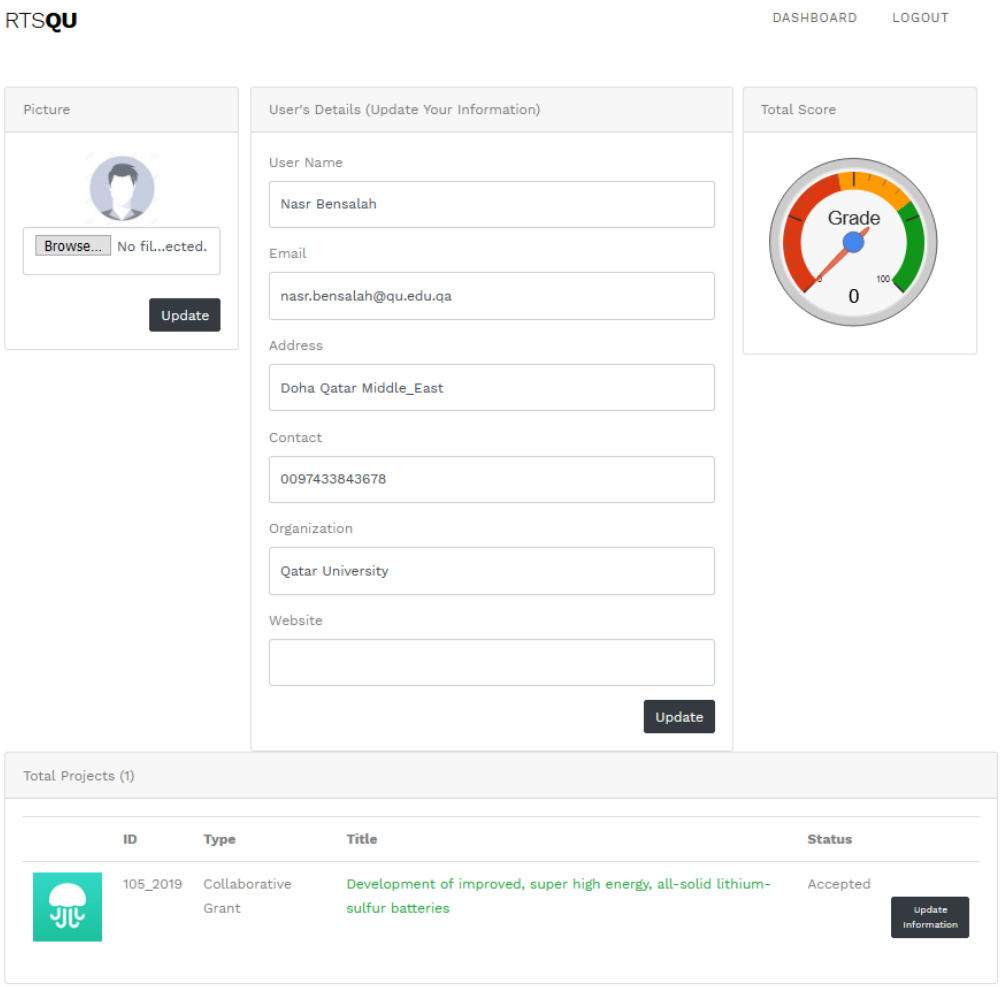


Figure 3: Sample of RTS interfaces

Figure 4 below displays the status of projects' progress reports for a particular LPI. The research office can analyze such statuses and notify the LPIs accordingly via automated emails. Prior to submission, the research office can notify the LPI about the projects' deadlines, and following the submission of progress reports, inform the LPI about the reports' vetting status and ultimate approval. Late submissions receive automatically negative points by RTS.

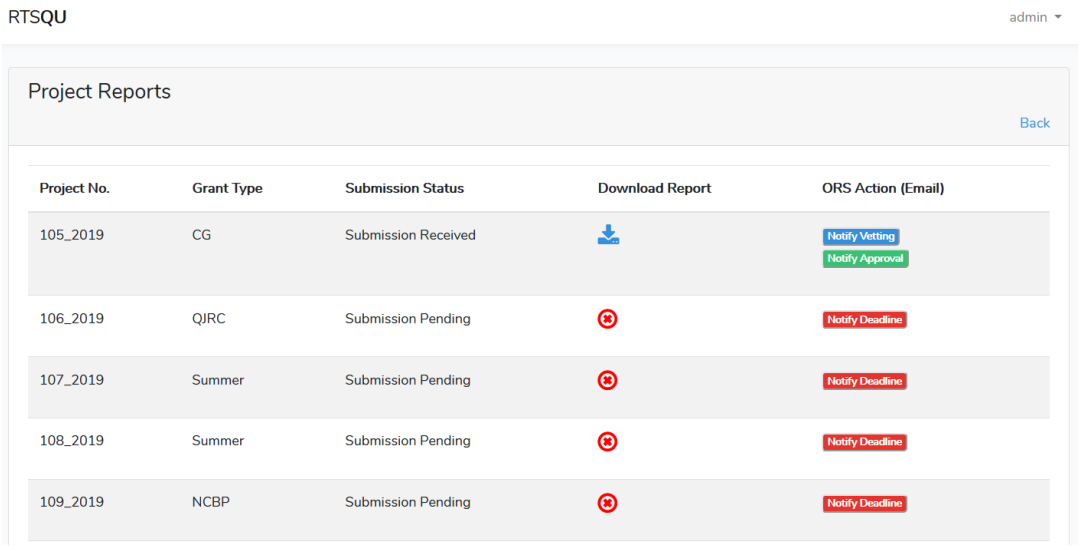


Figure 4: Example of projects' reports status

Figure 5 shows the statistics interface, accessed by ORS through the dashboard which graphically represents the information, for a particular cycle of grants, grants per cycle, per type of grant, per college/center, and per pillar. To highlight, the international research links of QU, the statistics interface specifically shows the grants awarded for International Research Collaboration Co-Fund (IRCC) per pillar and collaborating country. Lastly, the success rate (submitted vs. awarded) of each grant program is graphically displayed per cycle to observe the growth of the number of grant proposals and awards for each program from inception to date. This public information is also automatically mirrored on the ORS blog http://blogs.qu.edu.qa/orsg/ (section "Sections Statistics").

The deployment of RTS as an in-house solution reduces the costs and facilitates the interoperability with the university's existing systems (finance, human resources, students/staff databases) and selected external databases (international publication databases). Such technical interoperability is not addressed in this paper but could be further developed during the conference.

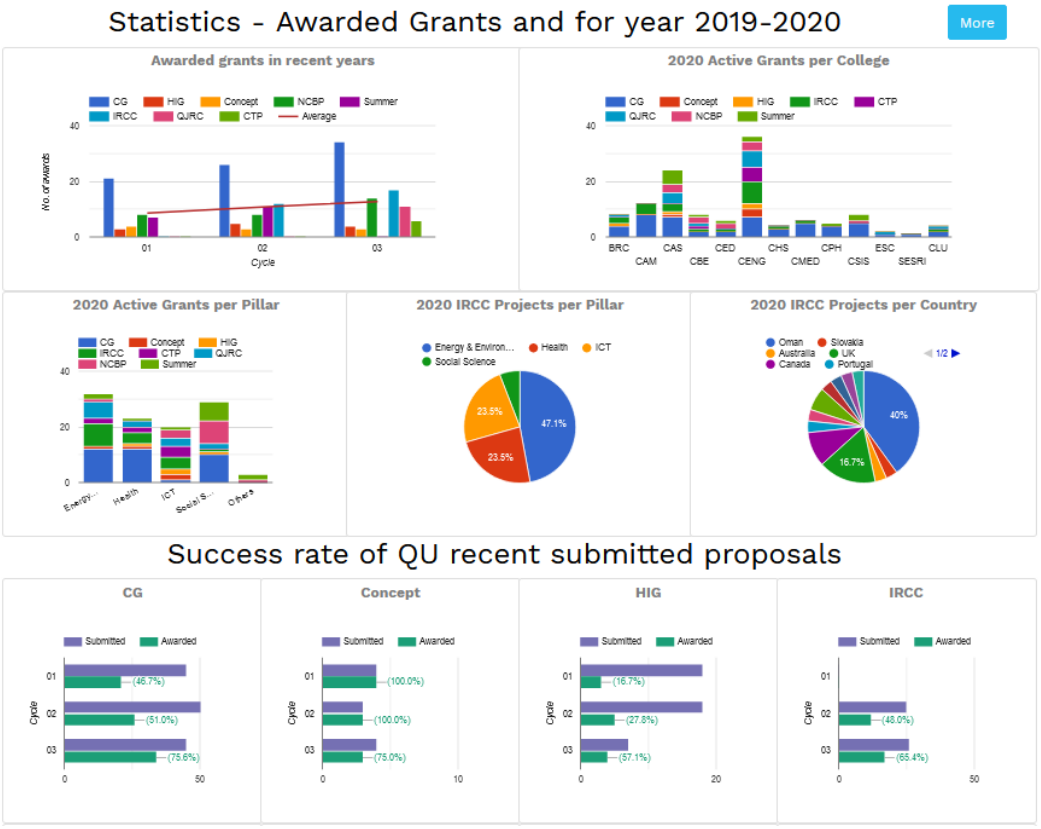


Figure 5: Status of projects' reports

4 Conclusion

This paper sheds the light on tools and platforms for research management and administration in general, focusing on an in-house developed research platform. This came as a response to the need for an interoperable solution for monitoring, reporting, and the tracking of progress of the research projects in an efficient manner. The requirements and implementation of the RTS are discussed in light of research workflows within QU and the major features of the contemporary grant management tools. Being an in-house system, the RTS allows the research office at QU to tailor and customize the functions, evaluation rubrics, and processes to the specificities of the funding programs offered by the University. In addition, the RTS supports better informed decisions at the pre-award stage when evaluating proposals for the various grant calls and designing new grant programs.

5 References

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6 Authors biographies

Prof. Abdelaziz Bouras is member of the Computer Science and Engineering Department of the College of Engineering at Qatar University. He is currently the Acting Director of the Office of Research Support of Qatar University. He managed several international projects (EU FP7, Qatar Foundation, French ANR, etc) and coordinated several Erasmus-Mundus programs between EU and East Asia. He published many research papers in refereed journals/conferences and edited several books. He also founded two international journals (IJPD, IJPLM) and published several books, one of them related to university-industry collaboration within the Industry 4.0 context. He is currently chairing the IFIP International Federation of Information Processing WG5.1, which publishes a yearly edited book with Springer.

Prof. Mariam Al Ali Al-Maadeed, is the Vice President for Research and Graduate Studies and Professor of Physics and Materials Science at Qatar University. She has been leading the research and graduate studies strategies, programs, and developments since 2016. She played a major role in developing the research and graduate programs, as well as fostering and strengthening national and international relations within this field. Prof. Mariam also holds national and international awards in many fields such as Physics, Women in Science, and others. She published many peer-reviewed papers, book chapters in Materials Science, Nanotechnology, and Higher Education. She is currently chairing the Academic Network for Development Dialogue, a new UN initiative related to implementing the SDGs within universities of the region and leading the initiative of the university transformation.

Hira Naseem received his B.Sc. in Computer Science from University of Peshawar, Pakistan. She is currently pursueing hher M.Sc in Computing at Qatar University. Her current interests are Machine Learning, Algorithm Design and Information Retrieval. Hira is also working as Graduate Assistant

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Shahbaz Hussain received his B.Sc. (Hons) and M.Sc. in Electrical Engineering from University of Engineering and Technology (UET) Lahore, Pakistan. He has an industrial experience of more than three years in various mega projects of Qatar. He is currently pursuing his PhD in Electrical Engineering (Power) from Qatar University and is involved in research work related to his field in the same department. His research interests are renewable energy resources, power system protection and optimization of power system in the fields of generation, transmission and distribution. He is also working as Graduate Assistant (GA) in the Office of Research Support, Qatar University where he supports to develop framework and services required to automate the processes of research grants.

Dr. Abdelali Agouni is currently Post-Award Manager (Office of Research Support) and Associate Professor of Pharmacology (College of Pharmacy, Qatar University). He is also the founding coordinator of the Ph.D program in pharmaceutical sciences since 2018. Dr. Agouni is an expert in cardiovascular and metabolic functions phenotyping and the study of cellular mechanisms associated with cardio-metabolic disorders (56 peer-reviewed publications in internationally leading journals to date). Dr. Agouni has successfully managed several competitive research grants involving teams inside and outside of Qatar with a cumulative research income of over $2 million in the past 5 years. He also has strong experience as an educator and has significant experience in both undergraduate and graduate teaching. He published several research papers in the field of learning and teaching.

Prof. Mohammed Al-Salem, is the former Director of Research Support and a Professor in the College of Engineering at Qatar University. In the Office of Research Support, he initiated several research and innovation programs, such as the High Impact, the Collaborative Grants, and the IRCC International Research Collaboration Co-fund programs. These programs had a great impact on the transformation of Qatar University into an international university. Prior to that, he held the position of Head of the Department of Mechanical & Industrial Engineering for several years. During his term, Prof. Mohammed introduced innovative pedagogical tools and platforms contributing to the digital transformation of his department.