

## Schedule Time to Build a Service Website for Diabetics

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### Abstract:

Diabetes is one of the most prevalent diseases, with an incidence rate of about 10%. It is considered one of the leading causes of blindness, kidney failure, heart attacks, and strokes. Diabetes can be managed, and its consequences can be avoided or delayed by following a healthy diet, exercising regularly, undergoing regular check-ups, and treating complications. The goal of this platform is to educate patients about this disease and how to live with it. With patients and specialized doctors as the primary operators of this platform, it will allow patients to benefit from several services, starting from entering and displaying their data, in addition to obtaining information about all recent discoveries, prevention methods, and related treatments. This platform will be dedicated to the Derna Diabetes Diagnosis and Treatment Center, where approximately 1,500 patients will interact with the platform and benefit from its services. Currently, patients at the Derna Diabetes Diagnosis and Treatment Center are communicated with either directly through visits to the center or indirectly online. However, there is no dedicated platform for the precise follow-up of diabetes patients, and the current database at the center relies on an Excel system. In this paper, we will study the scheduling of the implementation time of this platform using time management techniques, risk identification, and proposing appropriate solutions.

**Keywords:** Layout, Timeline, PERT Network, Gantt Chart, Risk Impact Matrix.

## جدولة الوقت لبناء موقع خدمة لمرضى السكر

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### ملخص:

يعتبر مرض السكري من أكثر الأمراض انتشاراً، حيث تصل نسبة الإصابة به إلى حوالي 10%، ويعتبر من الأسباب الرئيسية للعمى، والفشل الكلوي، والنوبات القلبية، والسكتات الدماغية. ويمكن إدارة مرض السكري، وتجنب عواقبه أو تأخيرها، باتباع نظام غذائي صحي، وممارسة الرياضة بانتظام، وإجراء الفحوصات الدورية، وعلاج المضاعفات. والهدف من هذه المنصة هو تثقيف المرضى حول هذا المرض وكيفية التعايش معه. مع اعتبار المرضى والأطباء المختصين المشغلين الأساسيين لهذه المنصة، سوف تتيح هذه المنصة للمرضى الاستفادة من عدة خدمات، بدءاً من ادخال وعرض بياناتهم، بالإضافة إلى الحصول على معلومات حول كل الاكتشافات الحديثة، وطرق الوقاية، والعلاج المتعلقة به. ستخصص هذه المنصة لمركز درنة لتشخيص و علاج السكري -Diabetes Diagnosis and Treatment Center، حيث يوجد حوالي 1500 مريض سيتفاعلون مع المنصة ويستفيدون من خدماتها. حالياً، يتم التواصل مع المرضى في مركز درنة لتشخيص وعلاج السكري -Diabetes Diagnosis and Treatment Center إما بطريقة مباشرة من خلال زيارة المرضى للمركز، أو بطريقة غير مباشرة عبر الإنترنت. ومع ذلك، لا توجد منصة خاصة لمتابعة دقيقة لمرضى السكري، وتُعتمد قاعدة البيانات الحالية في المركز على نظام الإكسل. في هذه الورقة، سوف ندرس جدولة وقت تنفيذ هذه المنصة باستخدام تقنيات إدارة الوقت، وتحديد المخاطر، واقتراح الحلول المناسبة.

الكلمات المفتاحية: التخطيط، الجدول الزمني، شبكة PERT، مخطط جاننت، مصفوفة تأثير المخاطر.

### 1. Introduction:

The electronic platform for diabetes is important because it provides many services for this segment, such as information on the types and risks of diabetes, how to detect and live with it, information on medications and their usage, information on measurements and the use of devices, nutrition plans for diabetics, addresses of diabetes doctors, and a virtual doctor to answer questions. It also contains a database to store the data and measurements of all patients, which will be used in the preparation of studies and statistics. This will save a lot of time and effort for patients, doctors, and researchers [1]. In project management practice, time is often viewed as something that can be managed [2]. Therefore, the success of a project depends on these independent variables [3]. As the person responsible for executing the project, the project manager must know the specific priorities of the project [4]. Many methods can be used to manage projects, but

almost all methods focus on managing project time and costs. One such method is the Gantt chart, which is used to illustrate the relationships between activities in a project. It is a time-scaled graph that displays each activity with a bar indicating the duration of the activity and the start and end times. It is easy to read when providing sufficient information about the activities in a short time frame. The main concept in the Gantt chart is the milestone tool used to determine the achievement of specific points along the project schedule, which serves as an indicator of the progress of the project. The Critical Path Method (CPM) is also used, which is a method that identifies the longest path and finds a critical path that can be shortened to speed up the project completion time. In shortening the project completion time, additional resources are needed or transferred from the non-critical path to the critical path [5]. The minimum project completion time is shorter than the expected time if there is no delay [6]. In addition, risks in projects must be monitored continuously because risks can always appear as indicators at different stages of the project life cycle [7].

## 2. Digital Diabetes Management Solutions

Recently, there has been a focus on investing in creating digital diabetes management solutions to support patient disease management through virtual and technological platforms. Over the past 15 years, a range of digital non-continuous glucose monitoring applications have been created and will be integrated into mobile and desktop devices. These applications, with the help of artificial intelligence, integrate different levels of clinical, behavioral, nutritional and educational assessment. With patients as the primary users of this application, these solutions aim to improve glycemic control by reminding them to track their blood sugar and providing additional information from meter readings. Interventions include digital reminders, trend analysis, goal setting and coaching. They also include physicians who can act as primary care providers for users. The appendix describes the common components of many digital diabetes tools (figure 1).

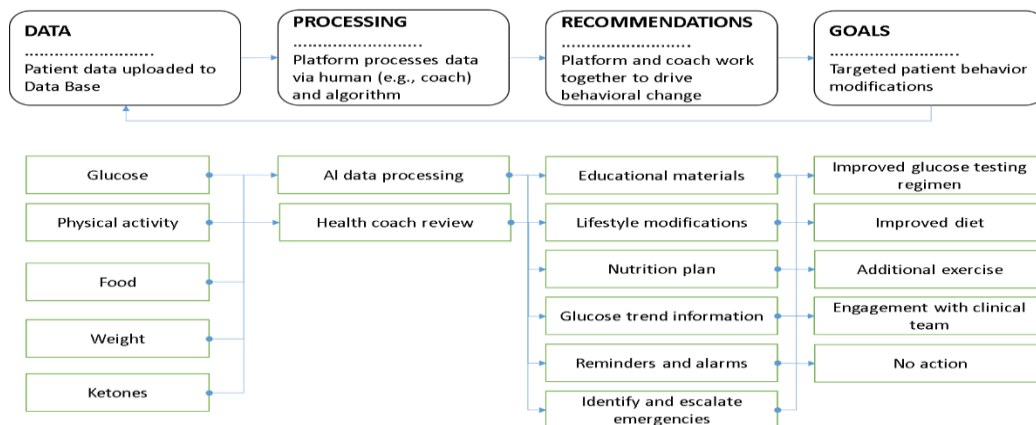


Figure 1. Elements of Digital Diabetes Management Solutions

### 3. Technical platform details:

Given the difference in functionality between patients and healthcare professionals, two front-ends were considered for the platform. One for patients and one for healthcare professionals, given the difference in functionality between the two groups. The patient interface will be a mobile app targeting Android, iOS and Windows, built using Flutter SDK; while the healthcare professionals interface will be a Single Page Application (SPA), which interacts with the user by dynamically rewriting the existing web page with new data from the web server. This interface will be implemented using Vue.js. The back-end of both platforms will be connected to a MySQL database that will be generated by an API. Both front-ends will be connected to Node. Js API, with a focus on speed, robustness and security in design and implementation. Since we are working with sensitive data, both application interfaces (mobile patient portal and healthcare professionals) are secured using Json Web Token (JWT). With middleware for authentication and verification requests and the Argon2 hashing algorithm to securely manage and store passwords.

### 4. Project Specifications:

While designing a site, it should be responsive to different devices, have a great impact on users, incorporate open-source system components, and be highly scalable [8]. The timeframe for the implementation of the platform and database construction is set at 10 months, during which equipment will be purchased, installed, and the database server and platform programmed, as well as experimentation and training conducted. The Agile methodology was also adopted for the management of this project [9, 10]. Planning is an essential tool for project management. It determines the work to be done, defines the goal, coordinates actions, perfects methods, and minimizes risks. The project has been divided into four main phases: the planning phase, divided into two tasks: setting project goals and planning design; the second phase, the processing phase, involves determining requirements for equipment and software, and then the task of buying, supplying, and installing this equipment. The third phase is programming the database and the website, or the user interface. In the last phase, the trial and training phase, the initial task is to test the platform and make the necessary modifications, followed by training users on how to operate this system [11].

### 5. Estimate task resources:

We analyzed each project activity and identified the tools and equipment needed to complete the project. Accordingly, the resources were estimated, and their availability and the assumptions on which the resources were selected were studied [12].

**TABL 1. Project tasks and resources**

Tasks	Resources Necessary
<b>Research and identification of goals</b>	Human resources, material resources, institutional support.
<b>Layout design</b>	Human resources, material resources, institutional support, software and technology: Canvas model.
<b>Define requirements</b>	customers, requirement documents and templates, time, environment and tools, documents and references.
<b>requirements Purchase</b>	Communications , list of potential suppliers, budget, procurement staff.
<b>Database Design</b>	Database Analyzer, Software & Tools: Microsoft SQL Server.
<b>Site programming</b>	Programmers and developers, Eclipse ,Graphic Design and User Interface: Sketch, Web Server and Hosting: Site Ground, Documentation and References, Database
<b>Test and launch site</b>	Stand-alone test environment, performance testing: Gatling, compatibility testing :Compatibility Testing
<b>operator training</b>	Electronic Devices, Preparing the Environment, Providing Training

To monitor the project implementation plan and progress, and to take corrective actions in a timely manner, several tools are used to alert to deviations in the project. In this paper, we have utilized both the Gantt chart and the PERT network [13].

#### 4.1 Gantt Chart:

One of the advantages of a Gantt Chart is that it displays tasks, their durations, and their sequences. It is used to display project tasks and the expected end date for each task, providing an overall timesheet view and a better understanding of the project. It is also used to communicate with the staff working on the project, thereby helping to increase operational efficiency and improve project results in terms of cost and time. The following table shows each task, its start date, the duration of each task, and the duration of each phase [14].

**TABL 2. Project task list**

	Time description of project	Start date	End date
<b>Task 1</b>	<b>Research and set goals</b>	<b>1/5/24</b>	<b>31/5/24</b>
<b>Task 2</b>	<b>Planning design</b>	<b>1/6/24</b>	<b>1/7/24</b>
<b>Task 3</b>	<b>Defining requirements</b>	<b>17/7/24</b>	<b>6/8/24</b>
<b>Task 4</b>	<b>Purchase requirements</b>	<b>15/8/24</b>	<b>26/8/24</b>
<b>Task 5</b>	<b>Database design</b>	<b>16/9/24</b>	<b>11/10/24</b>
<b>Task 6</b>	<b>Website coding</b>	<b>16/9/24</b>	<b>31/12/24</b>
<b>Task 7</b>	<b>Testing and launching</b>	<b>1/1/25</b>	<b>30/1/25</b>
<b>Task 8</b>	<b>Operator training</b>	<b>30/1/25</b>	<b>31/3/25</b>

The following figure shows a Gantt chart that visually represents the project tasks.

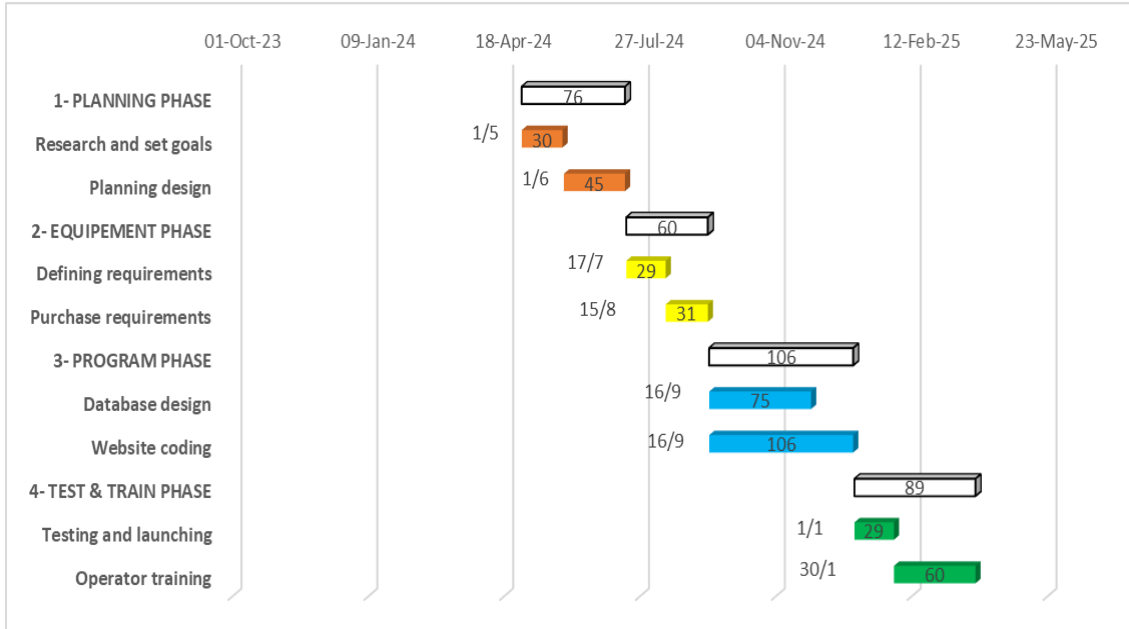


Figure 2. General project schedule

One of the advantages of the Gantt Chart is that each time the current performance of the project execution is updated, the chart will be adjusted to display an up-to-date schedule with new start and finish dates for incomplete tasks.

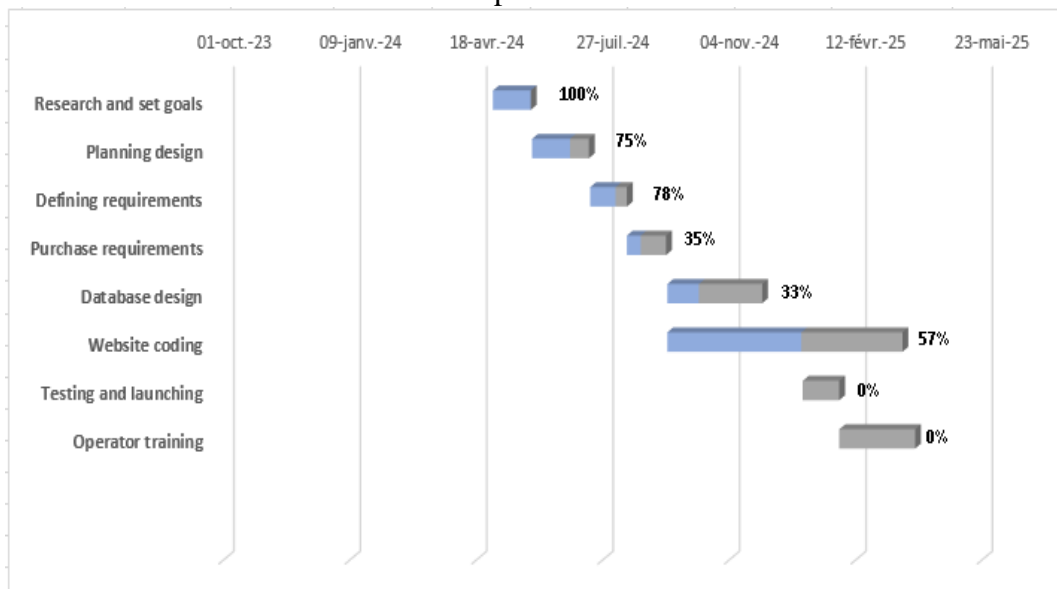


Figure 3. The percentage of completion of project tasks during the first six months

#### 4.2PERT Network:

Network diagrams are a very important tool for monitoring and controlling project progress. They are used to display the dependencies between project activities. This shows all the tasks involved in the project, how they are related, and the order in which they should be completed. They also provide a clear view of the critical path [15], which dictates the minimum time required to complete the entire project. This path should be considered every time the data is updated to avoid delays in the final delivery time of the project. By identifying the critical path, project managers can focus their attention and resources on ensuring that these time-sensitive tasks are completed on schedule [16]. Figure 4 shows the pert network diagram of the overall project schedule after adding the full duration estimates for each task in Figure 2, thus identifying the early and late starts, as well as the early and late finishes for each activity in this network, in addition to the critical path of the project.

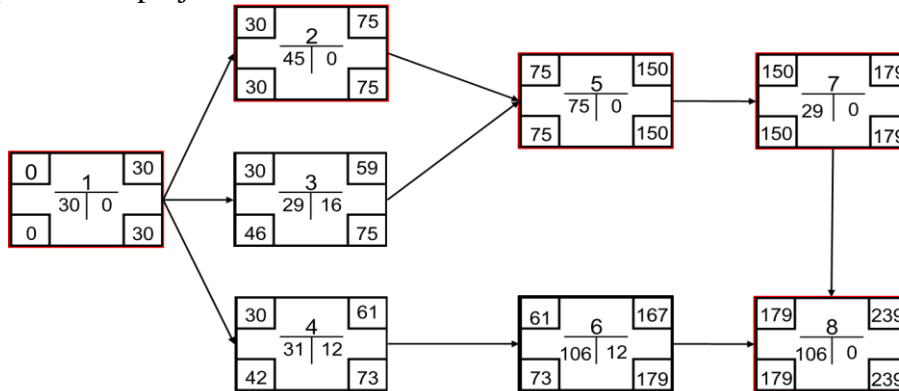


Figure 4. Pert network

#### 5. Risk management:

In addition to the risk of delay in the delivery of the project, there are also several risks that are normally identified at the planning stage by the project manager with the assistance of all experienced staff [17]. Each risk has a chance of occurrence and an impact factor ranging from 0 to 1. The following table shows these risks, their probabilities, and impacts:

**TABLE 3. The probability of occurrence and impact of risks**

ID	Risk	Probability	Effect on project	Prob. score	Impact score
1	Cyber-attacks and data loss	Very High	Very High	0.9	0.8
2	Delayed project delivery	High	High	0.7	0.6
3	Incompatibility with different browsers and devices	Medium	High	0.5	0.7
4	Lack of user interaction with the system	Low	Medium	0.3	0.5
5	Project cost overrun	Low	Very Low	0.1	0.1

Thus, the probability matrix is:

**TABL 4. Probability-Impact matrix**

Probability	Risk score = P*I				
0.9	0.09	0.45	0.54	0.63	0.72
0.7	0.07	0.35	0.42	0.49	0.56
0.5	0.05	0.25	0.3	0.35	0.4
0.3	0.03	0.15	0.18	0.21	0.24
0.1	0.01	0.05	0.06	0.07	0.08
	0.1	0.5	0.6	0.7	0.8
	<b>Impact</b>				

We note that the risk of cyberattacks and data loss has the highest impact.

## 6. Discussion and interpretation of findings:

From the Gantt Chart:

The following table shows the rate of completion of all the project tasks during the first six months. It is clear that there is a delay in completing some of the tasks, which means that there is a risk of a delay in the delivery of the project. This may result in an increase in the time and cost of the project. Consequently, the project manager has to adjust the plans to ensure that the project is completed within the specified time and to minimize losses in terms of cost and time [18].

From the PERT Network:

Figure 4 shows the PERT network for the project, showing that the critical path is located in the transition between tasks (8, 7, 5, 2, and 1).

The critical path is the most important, as it determines the overall project schedule.

Any delay in any of the tasks on this path will delay the completion of the project as a whole.

From the probability matrix, the priority risks are:

1. Cyberattacks and data loss: This type of risk is avoided by the risk transfer process, through an agreement with a protection company responsible for safeguarding the system in return for an annual contract, with the assurance that protection software will be continuously updated.
2. Project delivery delay. : In terms of impact is the delay in delivery, this risk can be addressed by involving experienced teams to expedite implementation.
3. Incompatibility with different browsers and devices: concerning the risk of hardware incompatibility, this risk can be transferred by contracting with a vendor who is responsible for selecting devices with high performance and efficiency.



4. Lack of user interaction with the system: If the user does not interact with the system, it can be mitigated by developing a flexible, user-friendly interface that is comfortable to use and easy to understand.
5. Project cost overrun: this risk can be managed through reserves by estimating additional costs in terms of delivery times and costs.

#### 7. Conclusion and recommendations:

The aim of this paper is to evaluate the implementation time of building an electronic platform for the Derna Center for Diabetes Diagnosis and Treatment. Initially, we discussed the importance of this platform for the patients' segment, as well as how doctors and researchers will benefit from the database that the website will provide. The implementation phases were divided into four main stages: the study and planning phase, the equipment and software preparation phase, the site programming phase, and the database development phase. The last component is related to experimentation and training. Project time scheduling was studied using a Gantt chart to display the overall timeline as well as the status of project completion within six months of implementation. We used the BERT network to demonstrate the critical path of the project. For foreseeable risks, using the impact matrix, the risks were identified, their impact assessed, and proposed solutions outlined.

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