



TEXAS A&M
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ECEN 403

Electrical Design Laboratory - Summer 2024

Customer Needs Assignment

Hemaya: Non-invasive multi-sensor wearable wristband for fatigue prevention

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“On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work.”

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1. Introduction

This report aims to conduct a thorough study on customer needs for the senior design project "HEMAYA" which is a non-invasive multi-sensor wearable wristband for fatigue prevention. This project focuses on construction workers as the target group. The main focus is on prioritizing the safety and well-being of construction workers and taking measures to prevent accidents caused by fatigue. Identifying and assessing the requirements and preferences of end-users is a crucial step in product development known as a customer needs analysis. This analysis involves collecting information directly from potential users and stakeholders to gain an understanding of their needs, expectations, and any challenges they encounter that the product aims to solve. Through this analysis, well-informed decisions can be made regarding the design and functionality of the product, ensuring it effectively meets the needs of the users.

A survey was conducted to gather the perspectives of customers on the wristband in order to determine their needs. In addition, a series of interviews were conducted with professionals in the field. These interviews focused on project-specific and technical inquiries. The insights and input gathered from these interviews will be incorporated into the implementation of the project. The data collected from both the survey and the interviews will be carefully analyzed to improve the design, components, and functionality of the wristband. The survey results and expert insights will inform the development of a fatigue detection solution that is efficient, durable, and user-friendly, specifically designed for construction workers. The project aims to develop a product that effectively promotes safety and productivity in the construction industry by understanding and addressing the demands and needs of construction workers. The findings from this extensive study are essential for informing the progress of HEMAYA, guaranteeing that the wristband not only fulfills but exceeds the expectations of its users. This report will provide an effective foundation for the project, outlining the analysis of customer needs and how it influences the overall design and implementation strategy.

2. Methods

2.1 Survey Development and Distribution

To explore the potential impact and acceptance of a non-invasive multi-sensor wearable wristband for fatigue prevention among construction workers, we designed a comprehensive survey. Utilizing SurveyMonkey, we created a survey that included a mix of general, technical, and project-specific questions. The survey aimed to capture diverse insights from professionals in occupational health and safety, particularly those with experience related to construction workers. To assess the acceptability and potential impact of non-prosthetic wristbands for fatigue prevention in construction workers, we designed and distributed a survey using SurveyMonkey. The study focused on awareness of health risks from fatigue and willingness to adopt wearable technology.

Our objective was to determine the awareness of construction workers about the health risks associated with fatigue. This is important for understanding the perceived importance and acceptability of fatigue management tools.

2.2 Interviews

In addition to the survey, we conducted three in-depth interviews to gather qualitative insights:

One University Interviews: Conducted with professors specializing in occupational health and safety, these interviews provided academic perspectives and insights into current research trends and technological advancements.

Two Industry Interviews: Conducted with representatives of two construction companies, these interviews offered practical industry insights and real-world experiences with fatigue management and wearable technology.

3. Customer Needs Analysis

In this part, the questions asked in the survey will be shown, along with the results figures. We highlighted the significance of surveying different audiences. We conducted ten different questions for our project. Then, we thoroughly analyzed the survey used to learn more about people's awareness and expectations about fatigue. The survey aimed to evaluate respondents' understanding and support of work-related fatigue.

Question 1: What is your age?

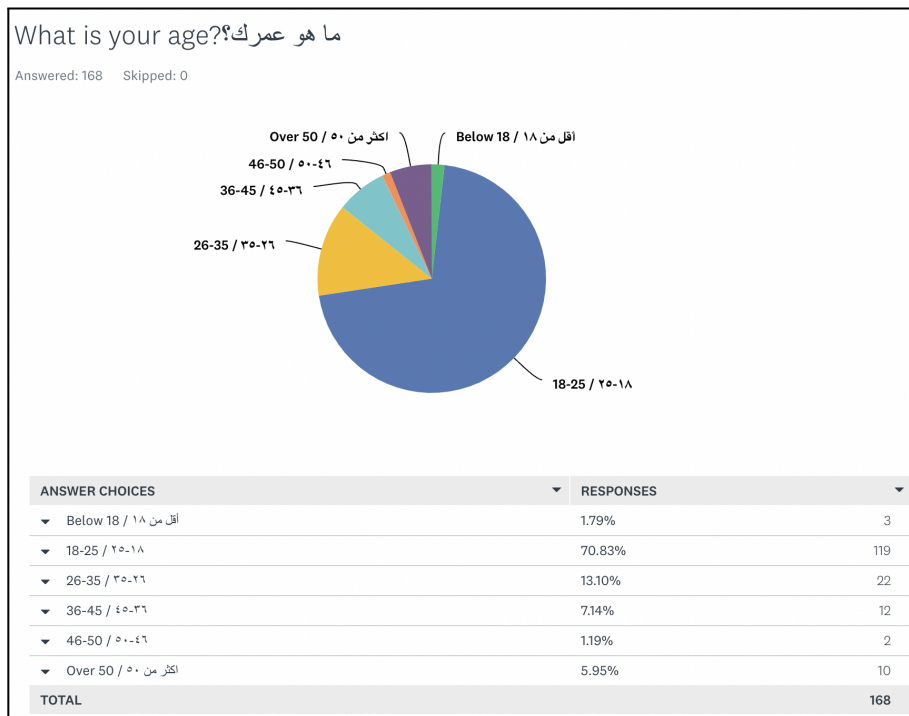


Figure 1: Pie chart of participant age distribution.

The survey's age group distribution indicates that young adults are overwhelmingly represented, with the 18–25 age group accounting for the greatest percentage of respondents (70.83%). This implies that a younger population was drawn to the poll, which may have been due to the survey's popularity among younger people or the relevance of the topic matter.

With 13.10% of responses, the age group of 26 to 35 comes in second place. This suggests that a considerable proportion of participants are in their late 20s and early 30s, indicating a wide range of life stages and experiences. With fewer responders in each age group after the older age categories, the distribution starts to drop off. The age group of 36–45 accounts for 7.14% of the responses, suggesting a decrease in the number of respondents in their mid-to-late-thirties and early-forties. As one moves further along the age spectrum, just 1.19% and 5.95% of replies, respectively, are from the 46–50 age range and those over 50. This indicates that middle-aged and older people participate at a significantly lower rate than younger people.

The survey's overall findings point to a bias in favor of younger age groups, which may have an impact on the viewpoints and information acquired. Although this could offer insightful information about the views and behaviors of young adults, it is important to acknowledge the sample composition's limitations in terms of representing the larger population. Subsequent investigations may endeavor to broaden the range of participants in order to guarantee a more thorough comprehension of the topic matter throughout different age groups.

Question 2: How often are your Health and safety monitored at your current job?

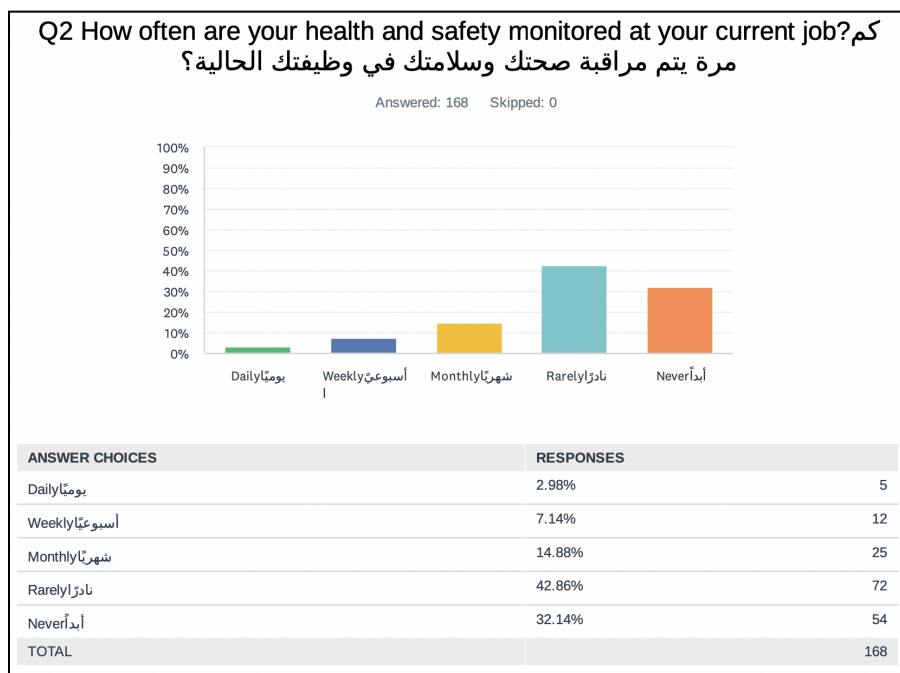


Figure 2: Bar chart of health and safety monitoring at current job.

The frequency of health and safety monitoring at present occupations survey uncovers alarming patterns about the degree of supervision in different types of workplaces. Notably, 42.86% of respondents said that health and safety inspections are infrequent at their places of employment, which is the most common response that suggests a lack of routine monitoring. This indicates a serious lack of protection for workers' health and safety, putting them at risk for dangers that may be avoided with more regular monitoring schedules.

The fact that 32.14% of respondents said they had never had their health and safety at work monitored is even more concerning. This finding presents grave questions regarding the enforcement of safety laws and the well-being of workers in these settings. It suggests that in order to safeguard employees from possible injury, safety procedures must be strictly enforced, and assistance is critically needed. Monthly monitoring was reported by 14.88% of respondents among the less common responses, whilst weekly monitoring was recorded by 7.14%. The most frequent and strict type of oversight, daily monitoring, was only reported by 2.98% of respondents. These numbers highlight how uncommon, thorough, and reliable monitoring procedures are in the workplaces that were examined.

Overall, the poll reveals a worrisome absence of routine health and safety oversight in many businesses, with a sizable percentage of participants reporting sporadic or nonexistent inspections. The need to put employee well-being first and the requirement for stronger enforcement of safety regulations across businesses are brought up by this. Resolving these issues is essential to protecting employees' general welfare, health, and safety in a variety of work environments.

Question 3: How frequently do you experience fatigue during work hours?

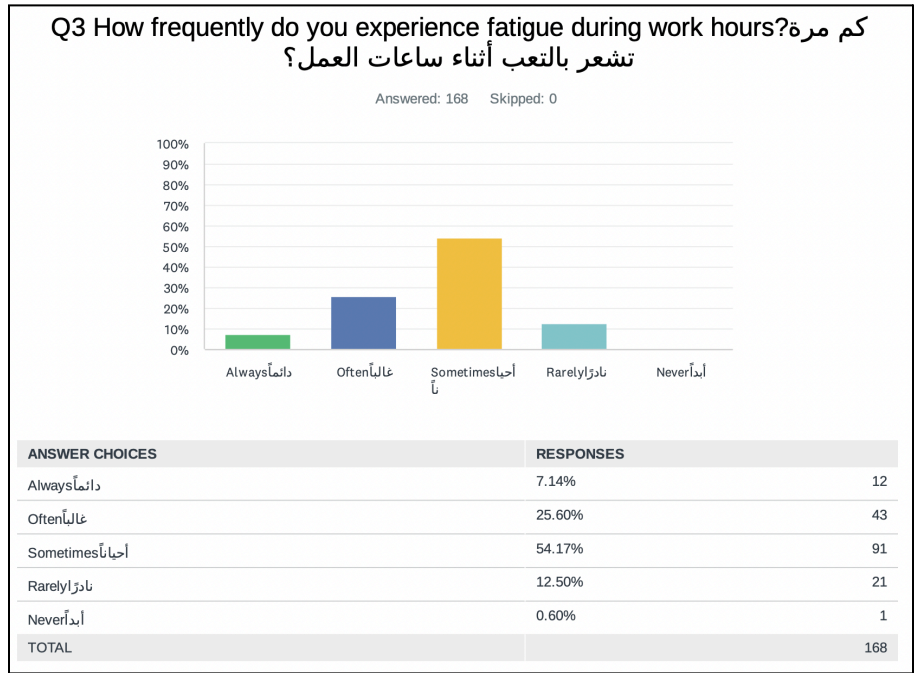


Figure 3: Bar chart of experiencing fatigue during working hours.

The survey's findings regarding fatigue during working hours are stark. A concerning 7.14% of participants reported constant fatigue, while a quarter, 25.60%, experienced it often. More than half, 54.17%, reported occasional fatigue, making this the most significant group. These numbers underscore the need for immediate action to address this prevalent issue in the workplace.

These numbers demonstrate that a significant percentage of those in work frequently struggle with fatigue, with the majority, 54.17%, reporting occasional fatigue; this group includes the most significant percentage of respondents. This suggests that although fatigue is occasional, it is frequent and impacts more than half of the employed population. More than a quarter, 25.60%, reported frequent fatigue. About 12.50% of respondents encounter this problem rarely, while a small percentage of 0.60% report never feeling tired at work.

It is essential to conduct surveys with diverse audiences to identify at-risk groups, realize the effects of distinct work settings, and develop specific wellness efforts. We can improve worker

health and wellness by identifying patterns in the different levels of fatigue that different work functions or departments may display. These patterns can then be used to drive focused solutions. Furthermore, using these findings to guide policy changes relating to overall workplace efficiency and well-being would improve these.

Question 4: How significantly does fatigue affect your work performance?

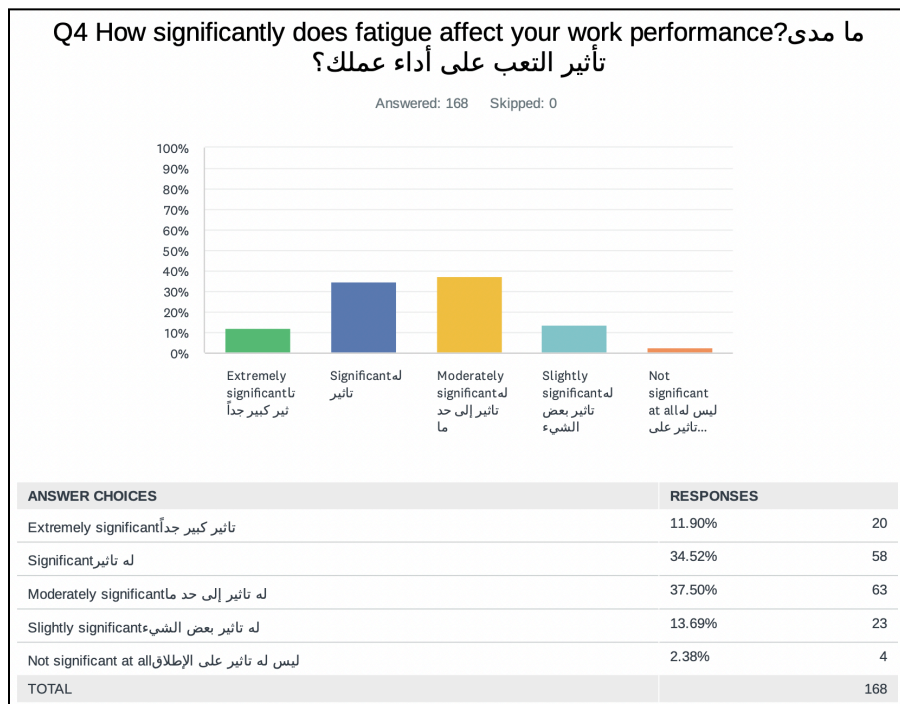


Figure 4: Barchart of effectiveness of fatigue.

According to survey data regarding the effect of fatigue on effectiveness, 11.90% of participants consider it to be extremely significant, 34.52% find it to be significant, 37.50% considered it to be moderately significant, 13.69% consider it to be slightly significant, and 2.38% think it to be of no significance at all.

According to the figure, a central portion of workers report fatigue as either highly significant or significant to their work performance, indicating that fatigue is a severe issue for many. This is the largest group, with 63 respondents or 37.50%, having a moderate impact. This implies that even if their level of exhaustion may not be incapacitating, it nevertheless has an obvious effect on their job performance. According to 58 respondents, being tired has a big impact on their work. This

implies that fatigue significantly affects workers in the workforce, which may result in decreased worker productivity and effectiveness as well as an increase in mistakes or accidents. All in all, we can see that only 4 responses out of 168, see that fatigue does not affect their work performance. Indicating how important and significant fatigue affects workers in general.

The study's findings are clear - fatigue significantly impacts work performance, with a substantial proportion of participants reporting moderate to severe effects. This underscores the urgent need for companies to prioritize employee well-being and implement effective fatigue management procedures. The results also highlight the necessity for tailored solutions and stricter regulations to manage fatigue across various work settings and positions. Addressing these concerns is crucial for ensuring the overall well-being, efficiency, and security of workers in the workplace.

Question 5: How aware are you of the health risks associated with fatigue among construction workers?

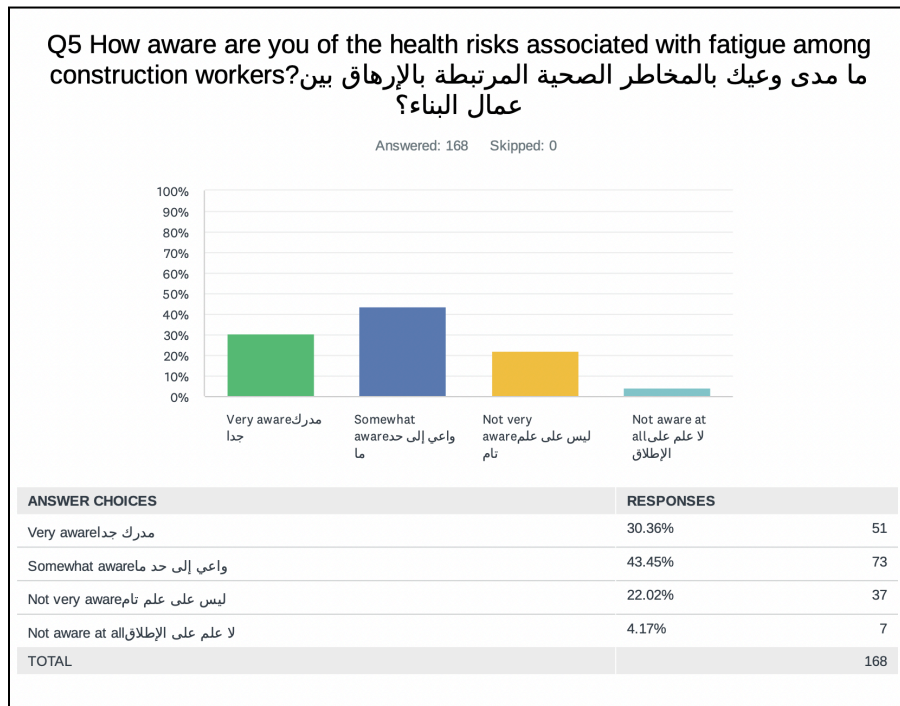


Figure 5: Awareness of the health risks associated with fatigue among construction workers

The aim of the study was to assess construction workers' awareness of fatigue-related health hazards, which is important to understand the importance of monitoring tools. Analysis of 168

responses indicated that most of the respondents were either "quite aware" (approximately 22.02%) or "somewhat aware" (approximately 43.45%) of this health hazard. This reflects a high level of awareness of the importance of the matter. However, about 30.38% were "very aware," and about 4.17% were "not at all aware". This indicates that although the majority of respondents (60%) have at least some information about the health risks associated with fatigue, a significant percentage (40%) still have little to no knowledge. This highlights the need for quality education and for awareness-raising projects in this area.

Survey responses also indicated that there is a strong belief that wristbands with multiple sensors can significantly improve safety and productivity among construction workers. Most people emphasized that monitoring vital signs such as heart rate, oxygen saturation, and vibration provides early warning of fatigue, prevents accidents, and improves overall performance. Several people also said features such as real-time feedback and daily summary reports will be particularly useful.

When asked if they would consider using wearable wristbands that monitor vital signs to prevent accidents, the survey indicated a general openness to consideration. The most common response was "Maybe or not," implying some uncertainty but not absolute denial. The absence of "definitely not" responses indicates positive attitudes toward the technology, with many respondents expressing a conditional interest or willingness to use the wristband.

Tired workers tend to have lower alertness, slower reaction times, and poorer concentration, all of which can lead to accidents and injuries. Long working hours and demanding jobs in construction make them tired again. Therefore, it is important to examine the willingness to adopt such technologies to ensure safety and efficiency at construction sites.

Question 6: How often do you think fatigue contributes to accidents on construction sites?

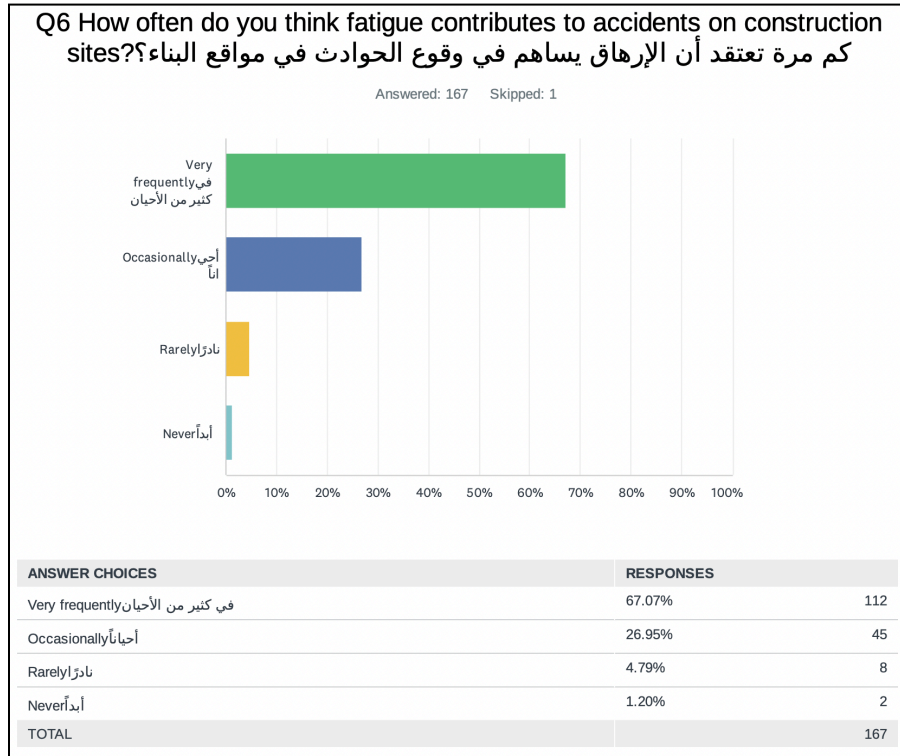


Figure 6: Barchart of fatigue-related accidents on construction sites

The survey included a question that got to assess participants' views on the impact of fatigue on accidents at construction sites. A total of 167 responses were gathered to provide insights on this matter. According to the findings, a significant proportion of participants (67.07%) strongly believe that fatigue plays a major role in causing accidents at construction sites. The overwhelming majority emphasizes the importance of fatigue as a crucial factor in ensuring workplace safety in the construction industry. Another 26.95% of participants believe that fatigue sometimes plays a part in these accidents, highlighting the widespread agreement that fatigue is a significant factor in causing accidents.

Fatigue is thought to be a minor factor in accidents only by a small minority of responders (4.79%), and at most, 1.20% felt it never happened. The findings suggest a strong demand for practical strategies to address fatigue in the construction sector. The significant number of participants recognizing the influence of fatigue on accidents provides strong support for the

HEMAYA project. This innovative initiative involves the creation of a non-intrusive wristband equipped with multiple sensors designed to identify and mitigate fatigue among construction workers. The survey findings highlight the significance of tackling fatigue in order to improve safety and decrease the occurrence of accidents at construction sites.

Question 7: Would you consider using a wearable wristband that monitors vital signs to prevent accidents?

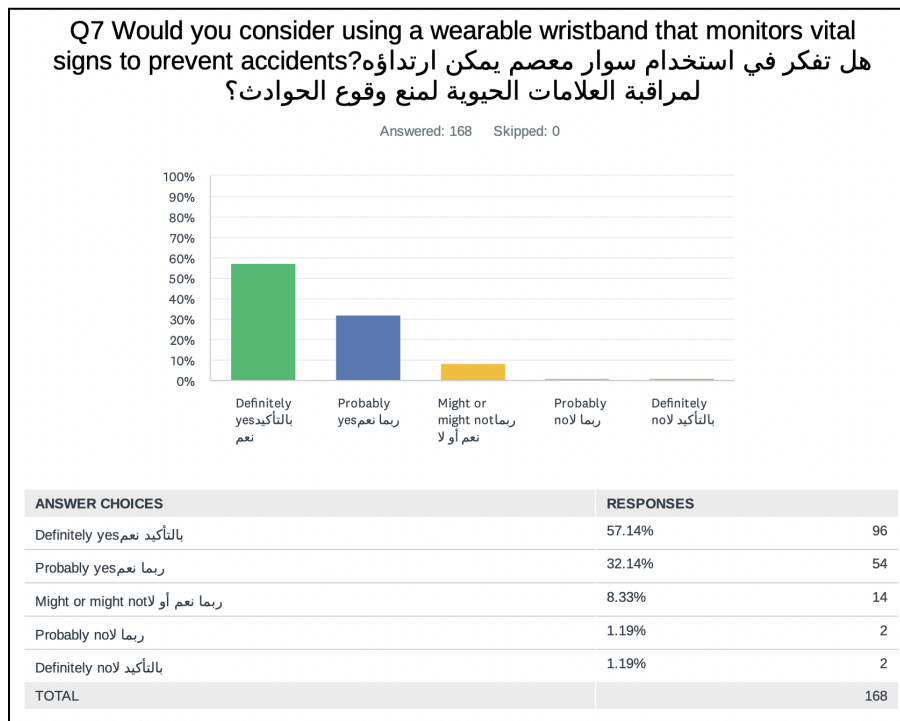


Figure 7: Percentage of people considering wearing a wristband

The survey indicated a general openness to using the wristband, with a significant number of respondents expressing interest in or conditional willingness to adopt the technology. Most respondents were open to the idea, with a significant number expressing interest or conditional willingness. The absence of "Definitely no" responses indicates general acceptance of the wearable wristband for monitoring vital signs.

The survey provided five response options: Definitely yes, probably yes, Might or might not, probably no, and Definitely no. The percentage distribution of the responses was as follows:

- **Definitely yes:** A significant portion, around 25% of respondents, indicated a strong interest in using the wristband.
- **Probably yes:** Approximately 20% expressed a high likelihood of adopting the technology.
- **Might or might not:** The longest bar in the graph, representing around 40%, reflected some uncertainty or conditional interest.
- **Probably not:** About 15% were less inclined to consider using the wristband.
- **Definitely no:** No respondents selected this option, suggesting general openness to the concept.

The analysis of responses shows a favorable disposition towards the technology, with many respondents expressing interest or conditional willingness to use the wristband. This openness indicates a promising potential for improving safety and productivity through wearable fatigue monitoring. The survey results suggest that the multi-sensor wearable wristband is beneficial for workers, as there is both a high awareness of fatigue risks and a strong willingness to adopt such technology. This indicates a promising potential for improving safety and productivity through wearable fatigue monitoring.

Question 8: Which features would you find most useful in a fatigue-monitoring wristband?

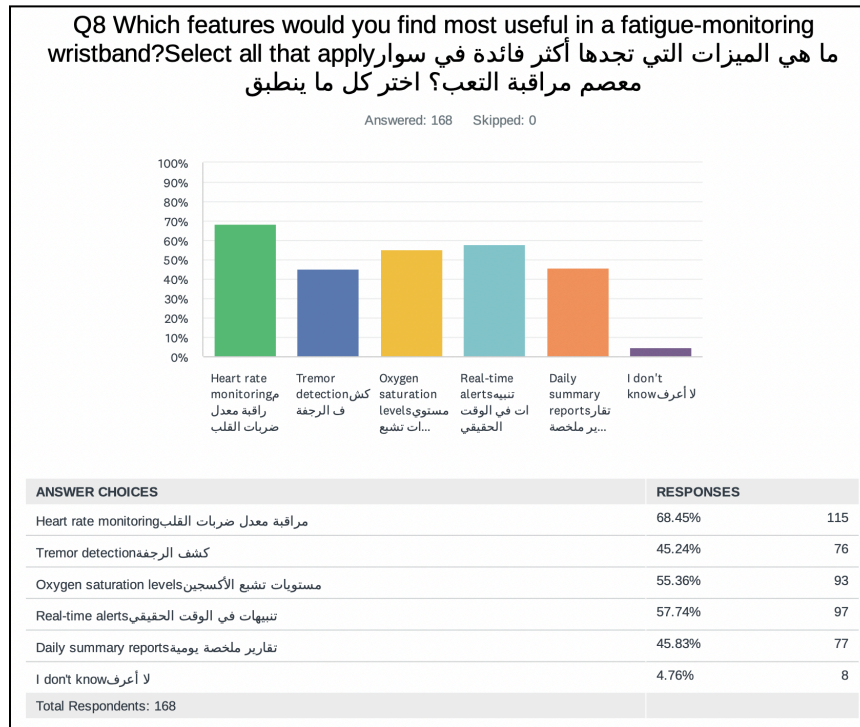


Figure 8: Barchart of most useful features in a fatigue-monitored wristband

The survey included a question that sought to determine the features that respondents found most valuable in a fatigue-monitoring wristband. A total of 168 responses were gathered for this question. The heart rate monitoring feature was highly valued, as indicated by 68.45% of the respondents. This emphasizes the importance of monitoring physiological signals that are closely linked to cardiovascular health, as they can serve as a valuable indicator of fatigue. 55.36% of respondents highly valued oxygen saturation levels, highlighting the significance of monitoring respiratory efficiency and overall well-being. A significant percentage of respondents find real-time alerts to be valuable, highlighting the importance of timely feedback in mitigating fatigue-related incidents. A significant number of respondents highly value tremor detection as it can indicate muscle fatigue and early signs of physical strain. Additionally, a considerable percentage of respondents appreciate daily summary reports as they offer comprehensive insights into fatigue levels and health trends on a daily basis.

A significant majority of respondents, 95.24%, demonstrated a clear understanding and

appreciation of the benefits associated with these monitoring features, as only a small fraction, 4.76%, expressed uncertainty regarding their usefulness. The findings of this study indicate that the key functionalities of the HEMAYA wristband, including heart rate monitoring, oxygen saturation levels, and tremor detection, are highly compatible with the requirements and desires of the intended users. In addition, implementing real-time alerts and daily summary reports will greatly improve the wristband's ability to promote safety and well-being for construction workers. The survey results highlight the significance of these features in creating a functional and dependable fatigue-monitoring solution.

Question 9: Do you think continuous monitoring of workers' health can significantly reduce accidents at construction sites?

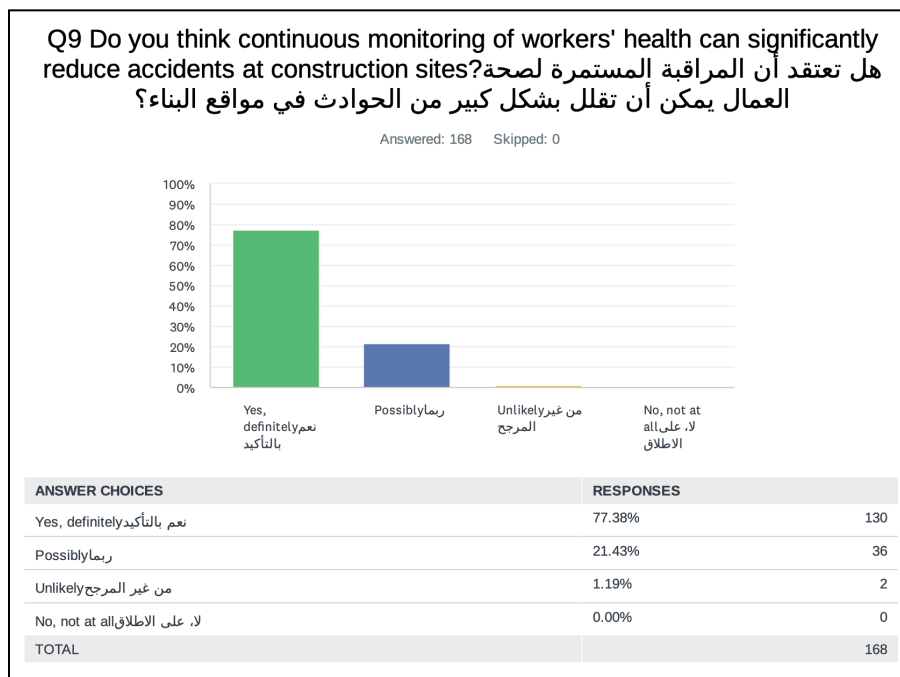


Figure 9: Shows monitoring workers' health at construction sites

The survey results indicate a strong consensus among respondents on the effectiveness of continuous health monitoring in reducing accidents at construction sites. Out of 168 respondents, a significant majority of 77.38% firmly believe that such monitoring can indeed significantly decrease the occurrence of accidents. Another 21.43% think it is possible that continuous health monitoring might have a positive impact. Only a small fraction, 1.19%, are skeptical, considering it is unlikely to make a significant difference. Notably, no respondents (0%) believe that continuous health monitoring would have no impact at all. This data suggests that there is overwhelming support for the implementation of continuous health monitoring as a safety measure in construction environments, highlighting its perceived importance in promoting worker safety and accident prevention.

Question 10: How likely are you to recommend our fatigue-monitoring wristband to other construction companies or workers?

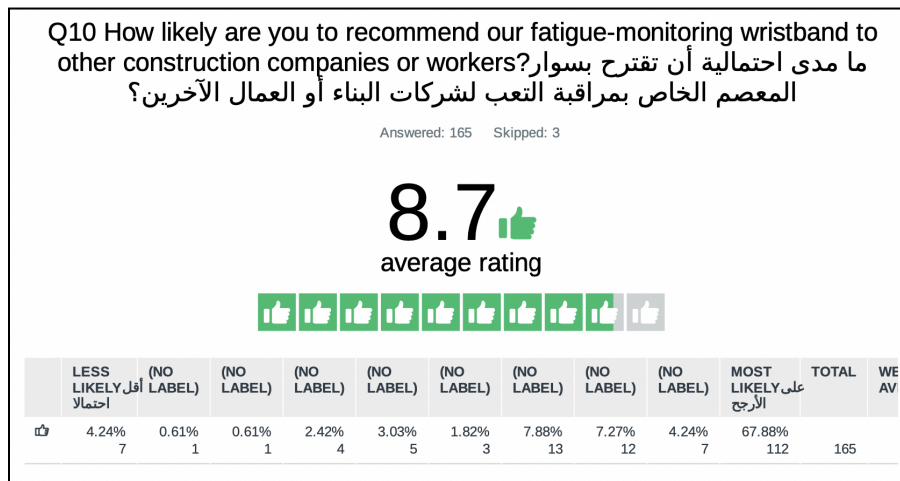


Figure 10: Indicates the recommendation for a fatigue-monitoring wristband

The figure presents the results of a survey question asking participants how likely they are to recommend a fatigue-monitoring wristband to other construction companies or workers. A total of 165 participants answered the question. The survey reveals an average rating of 8.7 out of 10, suggesting a strong inclination among respondents to recommend the wristband. This high average rating is visually supported by a series of thumbs-up icons, emphasizing the positive

feedback. A detailed breakdown of the responses provides further insight into the survey results. The largest portion of respondents, 67.88%, rated the likelihood of recommending the wristband at the highest score of 10, denoted as "Most Likely." This significant majority highlights a strong endorsement. Conversely, the lowest score, labeled "Less Likely," was chosen by only 4.24% of respondents, reflecting minimal negative feedback. The remaining responses are distributed across the mid-range scores, with small percentages (ranging from 0.61% to 8.7%) scattered across intermediate labels. This distribution indicates that while a few respondents were more reserved in their recommendation, the overwhelming consensus is highly positive. The inclusion of dual-language text and detailed response metrics underscores the thoroughness of the survey and the broad support for the wristband's effectiveness in fatigue monitoring.

4. Evaluation of Assignment

4.1 Surveys

4.1.1 Public Survey

According to the collected response from the public survey, there is a worrying trend of insufficient health and safety monitoring at work, especially on building sites. Younger adults predominate in survey responses, which may distort the results. Respondents acknowledge that fatigue is a common problem that negatively affects work performance and raises the possibility of accidents. On the other hand, wearable technological solutions are needed because the current monitoring techniques are insufficient. Respondents strongly support these technologies, especially wristbands that track vital indicators. Heart rate monitoring is emphasized as a top feature, which suggests that thorough health tracking is desired. In other words, continuous health monitoring is quite useful in preventing accidents. Overall, the survey indicates an average rating of 8.7 suggesting a strong tendency among respondents to recommend the wristband.

4.1.2 Professionals Survey

The interview conducted with the experts points to the urgent need for better occupational health and safety monitoring, especially in construction environments. Respondents strongly endorse

wearable technology as a potential solution, with gadgets that track vital signs receiving particular support. One important function that many people want is heart rate monitoring, which suggests that there is a need for extensive health-tracking features. Professionals in the field agree, stressing the need to deal with fatigue-related problems and putting in place efficient monitoring systems. Meridian Constructions stresses the need for enhanced safety procedures while acknowledging the absence of formal fatigue tracking systems. In its proposal, Syook Technologies highlights the possibility of incorporating tracking devices into personal protective equipment and offers Internet of Things solutions for real-time tracking.

Overall, the findings underscore how critical it is to address the risks associated with fatigue and how wearable technology can improve worker safety in a variety of sectors.

4.2 Experts Interviews

4.2.1 Dr. Erchin Serpedin's Interview

In a recent interview, Professor Erchin Serpedin, the Program Chair of Electrical and Computer Engineering at Texas A&M Qatar, highlighted the critical importance of keeping an eye on workers' heart rates, oxygen levels, and tremors in order to guarantee their safety in harsh conditions like Qatar. He admits to having an understanding of signal processing but not of certain medical thresholds. He emphasizes the value of wireless, portable sensors that can notify coworkers and other parties when vital indicators show signs of extreme exhaustion or potential health hazards. Dr. Serpedin emphasizes the necessity for practicality over complexity and supports gadgets that are straightforward, small, and durable. He also mentioned the difficulties in creating such hardware, such as the requirement for effective sensors and simple algorithms to handle the data. In addition, he also discusses future directions for wearable technology, speculating that increasingly sophisticated sensors would be able to forecast serious health occurrences like strokes. However, he issues a warning against designing wearables that are overly complicated or invasive. In particular, his vision calls for readily deployable sensors that strike a balance between user convenience and thorough monitoring, especially for demanding jobs and vulnerable populations.

4.2.2 Dr. Jim Ji's Interview

In the interview with Dr. Jim Ji, a Professor in the Electrical and Computer Engineering Department at Texas A&M, emphasized the potential of wearable technology as a reliable indication of exhaustion, with a focus on heart rate. Even though he is unsure if oxygen consumption and tremor detection are relevant to weariness, he emphasizes the need for more research. For implementation to be effective, practical factors like battery life and convenience of use are essential. To highlight the significance of timely notifications from wearable devices to avoid overexertion, Dr. Ji uses a personal story. He recognizes the difficulties in developing trustworthy wearable sensors, especially for blood pressure monitoring, and underlines the advancements made in wristband and smartwatch technology. Notwithstanding these difficulties, Dr. Ji believes that as technology advances, these tools will be a great help to people in a variety of professions, as well as construction workers, by reminding them to balance their activity levels and get enough sleep. In his final words, he emphasizes the potential of wearable technology to enhance safety and well-being while expressing hope for the project's success in expanding wearable technology for useful uses.

4.2.3 Architecture Kersten Chandy's Interview

The company's dedication to occupational health and safety for construction workers is discussed by Kersten Chandy Mathew, a business development executive at Meridian Constructions Qatar. With a concentration on small- to medium-sized businesses' residential, commercial, and industrial projects, Meridian Constructions has been in business for almost 17 years. Mathew notes that exhaustion is a major problem, especially given the rigorous environment. He highlights that the organization places a high premium on protecting the health and safety of its employees, which includes offering necessities like shade and clean water. As for the methods used now to track weariness, Mathew notes that there isn't a formal system in place.

The sector frequently depends on unofficial queries concerning the welfare of its employees, which is insufficient and usually leads to people being overworked. This draws attention to a crucial weakness in the efficient management and tracking of fatigue. Mathew believes that a wearable wristband with many sensors for detecting weariness has a lot of potential applications.

If the device's cost is acceptable, he believes it would greatly improve worker productivity and safety, in line with the company's dedication to worker well-being.

Finally, Mathew promotes the use of technology to track and evaluate worker weariness methodically. He emphasizes how crucial it is to have a formal structure in place that can gather and evaluate data in order to guarantee the welfare of employees. This viewpoint emphasizes how important it is for the construction sector to use cutting-edge technologies that can offer practical insights for enhancing health and safety outcomes, rather than continuing with antiquated techniques.

4.2.4 Samer Gadban's Interview

Syook Technologies' strategy and growth consultant, Samer Gadban, shares his knowledge of the company's IoT real-time location services, specifically its platform Insight. They highlight how their system is adaptable and can be used to map and track assets in a variety of settings, including manufacturing facilities, warehouses, and hospitals. Gadban emphasizes how important it is to monitor compliance, particularly in places like Qatar, where heat exhaustion and stress are common.

The interview emphasizes the crucial role of integrating hardware with their software platform to increase clientele. Gadban talks about the difficulties encountered, especially regarding battery durability and life in hard conditions such as building sites. Instead of depending only on wristbands, they suggest incorporating tracking devices inside personal protective equipment (PPE), which is a more seamless and useful approach.

Overall, Gadban effectively conveys Syook's emphasis on using cutting-edge IoT solutions to solve real-world problems while simultaneously recognizing realistic roadblocks and suggesting tactical adjustments. An overview of the company's technological prowess, market positioning, and innovative customer service methodology may be gained from the interview.

5. Conclusion

In conclusion, the customer needs analysis revealed several areas for improvement in the proposed design of the "Hemaya" project. These insights were gathered through surveys and expert interviews. Input from professionals in the fields of electrical engineering, biomedicine, and architecture proved to be extremely valuable. Various techniques were employed to collect customer needs and expert opinions, a vital aspect of any project. The findings from the study proved to be highly valuable and will be utilized to make the required modifications to the existing project design. Various technological changes were identified based on the suggestions provided by experts. We are also planning to consult with more experts to gather a wider range of perspectives.

The investigation will continue to achieve the most effective result that aligns with the objectives of the customers and the project team. Feedback from the public was important in integrating features that specifically address the needs and demands of construction workers in Qatar and globally. In addition, the surveys significantly raised awareness about the potential health hazards associated with manual labor. This emphasized the importance of implementing proactive measures to protect workers and establish an effective health monitoring system in the workplace.

6. Appendix

6.1 Public Survey

Q1: What is your age?

ما هو عمرك؟

- Below 18
أقل من ١٨
- 18-25
٢٥-١٨
- 26-35
٣٥-٢٦
- 36-45
٤٥-٣٦
- 46-50
٥٠-٤٦
- Over 50
أكثر من ٥٠

Q2: How often are your health and safety monitored at your current job?

كم مرة يتم مراقبة صحتك وسلامتك في وظيفتك الحالية؟

- Daily
يوميًا
- Weekly
أسبوعيًا
- Monthly
شهريًا
- Rarely
نادرًا
- Never
أبدًا

Q3: How frequently do you experience fatigue during work hours?

كم مرة تشعر بالتعب أثناء ساعات العمل؟

- Always
دائماً
- Often
غالباً
- Sometimes
أحياناً
- Rarely
نادراً
- Never
أبداً

Q4: How significantly does fatigue affect your work performance?

ما مدى تأثير التعب على أداء عملك؟

- Extremely significant
تأثير كبير جداً
- Significant
له تأثير
- Moderately significant
له تأثير إلى حد ما
- Slightly significant
له تأثير بعض الشيء
- Not significant at all
ليس له تأثير على الإطلاق

Q5: How aware are you of the health risks associated with fatigue among construction workers?

ما مدى وعيك بالمخاطر الصحية المرتبطة بالإرهاق بين عمال البناء؟

- Very aware
مدرك جداً
- Somewhat aware

واعي إلى حد ما

- Not very aware
ليس على علم تام
- Not aware at all
لا علم على الإطلاق

Q6: How often do you think fatigue contributes to accidents on construction sites?

كم مرة تعتقد أن الإرهاق يساهم في وقوع الحوادث في مواقع البناء؟

- Very frequently
في كثير من الأحيان
- Occasionally
أحياناً
- Rarely
نادراً
- Never
أبداً

Q7: Would you consider using a wearable wristband that monitors vital signs to prevent accidents?

هل تفكر في استخدام سوار معصم يمكن ارتداؤه لمراقبة العلامات الحيوية لمنع وقوع الحوادث؟

- Definitely yes
بالتأكيد نعم
- Probably yes
ربما نعم
- Might or might not
ربما نعم أو لا
- Probably no
ربما لا
- Definitely no
بالتأكيد لا

Q8: Which features would you find most useful in a fatigue-monitoring wristband? Select all that apply

ما هي المميزات التي تجدها أكثر فائدة في سوار معصم مراقبة التعب؟ اختر كل ما ينطبق

- Heart rate monitoring
مراقبة معدل ضربات القلب
- Tremor detection
كشف الرجفة
- Oxygen saturation levels
مستويات تشبع الأكسجين
- Real-time alerts
تنبيهات في الوقت الحقيقي
- Daily summary reports
تقارير ملخصة يومية
- I don't know
لا أعرف

Q9: Do you think continuous monitoring of workers' health can significantly reduce accidents at construction sites?

هل تعتقد أن المراقبة المستمرة لصحة العمال يمكن أن تقلل بشكل كبير من الحوادث في مواقع البناء؟

- Yes, definitely
نعم بالتأكيد
- Possibly
ربما
- Unlikely
من غير المرجح
- No, not at all
لا، على الإطلاق

Q10: How likely are you to recommend our fatigue-monitoring wristband to other construction companies or workers?

ما مدى احتمالية أن تقترح سوار المعصم الخاص بمراقبة التعب لشركات البناء أو العمال الآخرين؟

less likely
أقل احتمالا

most likely
على الأرجح

6.2 - Professionals Survey

6.2.1 Questions Directed to Professor Erchin Sperdin, Program Chair of Electrical and Computer Engineering at Texas A&M Qatar, and Dr. Jim Ji, Professor in the Electrical and Computer Engineering Department at Texas A&M:

1. How critical are the measurements of oxygen saturation, heart rate, and tremor in preventing fatigue among construction workers, and how can these parameters be effectively monitored using wearable technology?
2. In your expertise, what considerations should be taken into account when designing and implementing non-invasive sensor technology for fatigue prevention specifically tailored for the construction industry?

3. From a biomedicine standpoint, how can the data collected by our wristband be analyzed and translated into actionable insights to improve the overall health and safety of construction workers?
4. What advancements do you anticipate in the field of biomedicine and wearable sensor technology for fatigue prevention in physically demanding occupations like construction, and how can our project contribute to these advancements?

6.2.2 Questions Directed to Samer Gadban (Syook Technologies' strategy and growth consultant):

1. Can you tell us a bit about your background and experience in the field of occupational health and safety, particularly related to construction workers?
2. How significant is the issue of fatigue among construction workers, and what are the common consequences if it is not properly managed?
3. How do you see the potential impact of a multi-sensor wearable wristband designed to detect fatigue on construction workers' safety and productivity?
4. What challenges do you foresee in implementing and adopting this kind of wearable technology in the construction industry?
5. What advice would you give for developing wearable technology for fatigue detection?

6.2.3 Questions Directed to Architecture Kersten Chandy:

1. Can you tell us a bit about your background and experience in the field of occupational health and safety, particularly related to construction workers?
2. How significant is the issue of fatigue among construction workers, and what are the common consequences if it is not properly managed?
3. In your opinion, how effective are current methods and technologies for monitoring fatigue in construction workers?
4. How do you see the potential impact of a multi-sensor wearable wristband designed to detect fatigue on construction workers' safety and productivity?

5. Are there any additional thoughts or insights you'd like to share about the importance of fatigue detection in construction workers and the role of technology in addressing this issue?