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<!DOCTYPE html><!--validated with Firefox HTML validator 0 mistakes-->
<html lang="en">
<head>
    <meta charset="UTF-8">
    <title>Aleksandar Mladenov 2976196</title><!-- HTML title structure  -->
    <link rel="stylesheet" href="css/index.css"><!-- link to CSS style sheet   -->
</head><!-- HTML head  -->
<body><!-- HTML body  -->
<header id="header"><h1><a href=index.html>Aleksandar Mladenov 2976196</a></h1></header>
<div id="index"> <!--DIV with id covering the whole page   -->
    <section id="section1">
        <section id="section3"><!-- section containing the main navigation panner  -->
            <ul id="TopNavigationBar"> <!-- The bar is standard across all pages with 3 classes for style purposes  -->
                <li class="option1"><a href=index.html>Main Page</a></li>
                <li class="option2"><a href=bibliography.html>Bibliography</a></li>
                <li class="option3"><a href=about.html>About Author</a></li>
            </ul>
        </section>
        <div class="Box1"><!-- box 1 contains the whole main article i experimented both with classes and IDs -->
            <section id="section4"><!-- the box is subdivided in to sections for anchor navigation   -->
                <h2 id="Main title">QUANTUM COMPUTING</h2> <!--Main title   -->
                <h3 id="subtitle">Our future or a dream</h3><!--subtitle   -->
                <h3>Introduction</h3><!-- heading for the first paragraph  -->
                <p> Quantum computing is an exciting new field which is emerging out of the realm of science.
                    It offers a new and more advance way of computing calculations which promises to increase
                    speeds exponentially. The technology is still in its infancy however as of now it is showing
                    promising results. Quantum computing's core principles have been questioned since there
                    proposals. However recent scientific research done by Google and IBM has silenced critics
                    with the demonstration of a principle called "Quantum Supremacy". In short, this principle
                    implies that this new form of technology outperforms classical computing(4).Most new technologies have been questioned
in their infancy however time and science either prove or
                    disprove them. The very idea of using transistors instead of vacuum tubes was seen as
                    unusual by some scientists back in their day(3) .The below report aims to show a brief
                    overview of the technology using a variety of web sources which although explore different
                    points of view also test empirical data.
                </p>
            </section>
    <section id="section5"><!--Section 5 contains the main body of the study   -->
        <h3>Study</h3>
        <p> Quantum computing can trace its history to the 1980s when Paul Benioff proposed a non-traditional
            model of computation. (1) Traditional computing is based on the principles of the Turing machine
            which can make their computation based on bits which have to states true represented by "1" or false
            represented by "0". Quantum computers on the other hand work on a different principle. Instead of
            using bits for the two traditional states they use something which is called a qubit (quantum bit).
            These manage to enclose both "1" and "0" in a single cell that can be one of both states. The change
            may seem like doubling the capacity but in reality this does much more it gives the computer an
            infinite amount of calculating power as the possibilities grow exponentially (2).</p>
        <p> How does the technology exactly work, is best explained by looking inside the principles of one of
            these machines. For the technology to work much like a regular computer it needs to stay cold and
            not overheat. This though is taken to the extreme this machines operate near absolute "0 " of
            -273.15 Celsius or as close as possible(6). Introducing heat to the system does not burn it out but
            makes is prone to errors(5).Bellow are outlined the main principles of operation as outlined by IBMs
            research (5).</p>
        <ul><!-- i decided to use one un-ordered list and one ordered list as well  -->
            <li>Qubit Amplification. The qubit who holds both true the and false states is cooled down to a
                temperature of 4 Kelvin which is the equivalent of -269.15 Celsius(5).
            </li>
            <li>Microwave lines. When inputting them special attenuation is applied to lower the chance that the
                qubits receive thermal distortion. In physics the term implies a gradual loss of flux intensity.
                This is achieved by a single flux quantum microwave chopper (7) (5).
            </li>
            <li>Superconducting the coaxial lines. In this stage to minimise the loss of energy superconductors
                are used (5).
            </li>
            <li>Cryogenic Isolators. These would allow the qubits to proceed without exposing them to thermal
                heat. The job of the cryogenic isolators is to allow the function of the particles without
                exposing them to heat noise (5).
            </li>
            <li>Quantum Amplification. Amplifiers inside a magnetic shield catch and enhance the readouts from
                the computation. This technology is not exclusive to the field its widely used in physics for
                laser and optical amplification. To put it simply whatever passes though in this stage is
                amplified and while classical amplification is for classical signals this one takes quantum
                signals (8) (5).
            </li>
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            <li>Cryoperm shield. The processor is housed in this compartment the main job of which is to protect
                it from solar radiation. Some quantum computers take this to the extreme and are housed in
                underground mines or bunkers over a kilometre under the earth to minimise incoming solar
                radiation(5).
            </li>
            <li>Mixing Chamber. This is located at the lowest part of the quantum computer its designed to
                provide to power to keep the whole system cold and bring it to temperatures lower than outer
                space. (5)
            </li>
        </ul>
        <p>All the above technology may seem wasteful given the fact that at present quantum computers cannot
            substitute classical computing. However, baring that in mind the technology is still new an
            undeveloped however the potential is fascinating and unquestionable. Quantum computers can factor in
            large numbers which can take regular computing hundreds or thousands of years. These can have
            massive effects on cryptography and scientific calculations allowing scientists to map the universe
            much faster for example(2). Quantum computing has the potential to advance scientific research much
            like classical computers did back when they were introduced allowing for the massive leap in
            technology which we have experience in the last 70 years. It's expected that the technology would
            bring great advances(9).</p>
        <ol><!-- i decided to use one un-ordered list and one ordered list as well  -->
            <li>Unassisted Machine Learning, where AI can essentially duplicate the functions of a human brain
                and learn much like a child would.
            </li>
            <li>Optimisation of Travel and Cryptography, both computations deal with a massive number of
                variables and outcomes and if the result seems simple getting to it requires a massive amount of
                computing power.
            </li>
            <li>Biomedical simulations, with the possibility to simulate environments to the atomic level
                scientists will be able to study the human body in ways which are hard to imagine at present
                giving medicine an biology new understanding the anatomical field
            </li>
            <li>Finance, the financial services industry is among the key leaders in the push for a development
                of quantum computers which calculating potential will have a great effect in the industry.
            </li>
        </ol>
    </section>
    <section id="section6"> <!-- This part contains the final conclusion of the article  -->
        <h3>Conclusion</h3>
        <p>Quantum technology is progressing rapidly. However, now a fully functional quantum computer doesn't
            exist. Prototypes build by the likes of Google and IBM are scientific experiments rather than fully
            functional machines. Having said that the technology is rapidly advancing and is showing
            commercial application. Quantum sensors and quantum actuators have been developed which
            allow scientist to navigate micro-environments with unmatched flexibility and precision.
            Such advances are going the make possible the creation of true quantum microprocessors (2).
            From financial services to the medical sector the possibilities for quantum computers are
            vast. If these machines prove feasible in the future the benefit to the whole of mankind could be
            enormous(9).Needles to say they could replace present day computation the way classical computers
            replaced pen and paper.</p>
    </section>
</div>
<div class="Box2"> <!-- Box 2 contains all the elements of the menu navigator   -->
    <section id="section7">
        <figure><img src="images/IndexPic8.png" alt="Computer Component: Credit https://pixabay.com/vectors/motherboard-circuit-
diagram-circuit-152501/ "
                     title="A computer Motherboard Component Credit https://pixabay.com/vectors/motherboard-circuit-diagram-circuit-
152501/" width="250"/>
        </figure>
    </section>
    <section id="section8"> <!-- anchors for navigation * -->
        <p id="NavigationInstructions">Use below links to navigate research content</p>
        <ul>
            <li><a href="#header">Top</a></li><!-- anchor that brings user to top of page -->
            <li><a href="#section4">Introduction</a></li><!-- anchor that brings user to section 4 -->
            <li><a href="#section5">Study</a></li><!-- anchor that brings user to section 5-->
            <li><a href="#section6">Conclusion</a></li><!-- anchor that brings user to section 6-->
        </ul>
    </section>
    <section id="section9"> <!-- Section 9 contains the footer as specified by assignment   -->
        <footer><a href=mailto:"aleksandar.mladenov@student.griffith.ie" target="_blank">Email: Aleksandar Mladenov 2976196
</a></footer>
    </section>
</div>
</section>
</div>
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</body>
</html>
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