



Roboteach Child Development Robot

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Introduction & Overview

Background information on our company: We are The Robot-X Company, founded and established in Poland since 2012. The Robot X Company is an innovative company providing robotic instruments to make everyday life easier, which include production of household appliances to research and development of intelligent robots. Our previous products include smart home gadgets such as robotic vacuum cleaners with smart sensors, a robotic mop with smart sensors, an automatic lawn mower which can be remote controlled, and an automatic wall painter which draws any shape it is commanded to. The company now has a new project in mind to develop a child development robot.

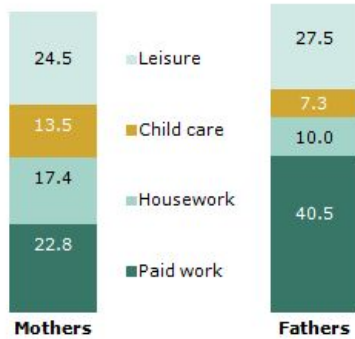
With the recent developments in technology, our lives are now surrounded by assistance from robots in more ways than one can imagine. From household appliances to travel, we use the help of robotic devices. According to a research performed by Businesswire, the assistive robotics market is expected to register a CAGR (Compound Annual Growth Rate) of 21% over the forecast period of 2019-2024. As people's lives get busier and the clients are getting used to living in the comfort of robotic assistance in every aspect of their lives, the demand for new products also gets higher. It is vital for a company's growth to keep up with the changing times and meet the demand from the potential customers.

One essential element in human life which will never go out of style is family and the values it brings. Parents are naturally inclined to provide for their children. Although most working parents are able to provide food and shelter for their children, today's working conditions and long duty hours make it harder for the modern parents to communicate with their child and contribute personally to their mental and emotional development. According to a study by Pew Research Analysis, parents spend less than a quarter of their time with their

child because the rest of their time is occupied by their paid job and daily chores.

How Moms and Dads Spend Their Time

Average number of hours per week spent on ...



Note: Based on adults ages 18 to 64 with own child(ren) under age 18 living in the household. Paid work and child care include relevant travel time.

Source: Pew Research Center analysis of 2010 American Time Use Survey.

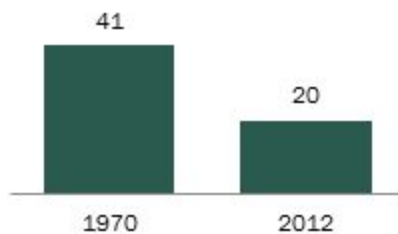
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We can summarise modern parenting with the following data:

1. The modern mother is also working and has less time to spend on their kids.

Children with a "Traditional" Stay-at-Home Mother

% of children with a married stay-at-home mother with a working husband



Note: Based on children younger than 18. Their mothers are categorized based on employment status in 1970 and 2012.

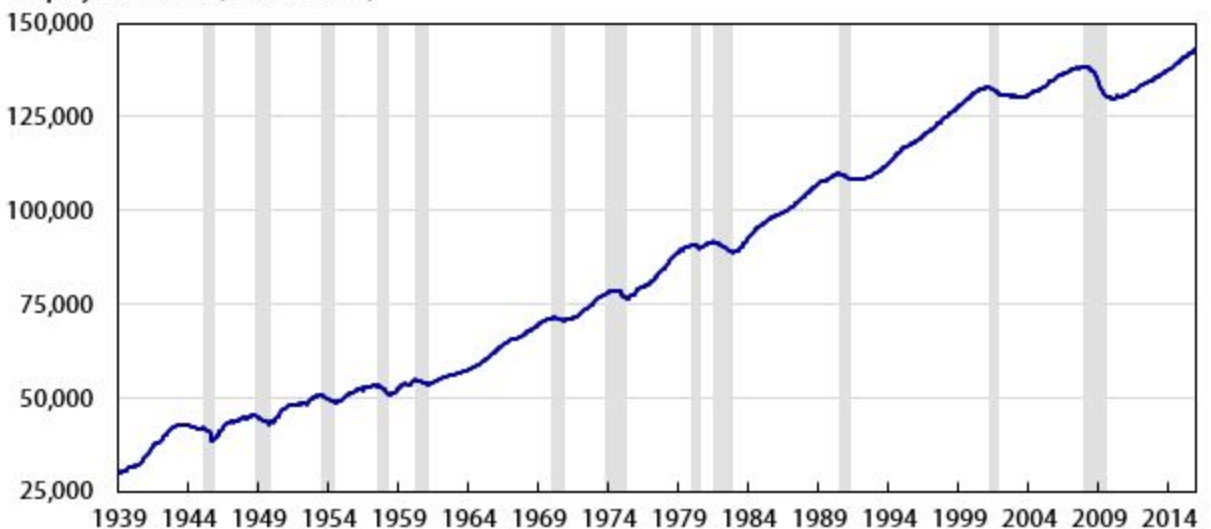
Source: Pew Research Center analysis of March Current Population Surveys Integrated Public Use Microdata Series (IPUMS-CPS), 1971 and 2013

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2. Education now is easier to reach than before due to the internet and technological developments. Even though it is a development for humanity, it also has its downsides; such as putting too much pressure on people to outweigh others. In today's competitive society, people are expected to have the ability to have more than one talent. This applies to both parents and children. People who already have too much on their plate (a job, a family, personal issues, personal development, hobbies) it might be too difficult to balance their life while meeting the expectations of society.
3. Most people today have a business-related job located in and around big cities, most of the time in a far proximity to their home. This is contradictory to how the situation was around 80-100 years ago; where the farming jobs in rural areas were popular amongst citizens. This means that today we have higher income (especially with the mothers being more involved in higher authority jobs), however more limited time to spend on family considering the added travel time to and from their jobs.

Figure 1. Total nonfarm employment, seasonally adjusted, January 1939–December 2015

Employment level (in thousands)



Note: Shaded areas represent recessions as determined by the National Bureau of Economic Research.

Source: Current Employment Statistics, U.S. Bureau of Labor Statistics.

4. Children now are more inclined to spend time with technological gadgets rather than traditional books and/or toys. According to a research, "time children spend on mobile devices has tripled in four years" from 2013 to 2017 (Ashley Hopkinson, [Time children spend on mobile devices has tripled in four years](#), 2017).

This data has inspired Roboteach to come to life. Now with the help of a child development robot, parents can invest their money into this robot and in return get a full time stay at home robot which will aid in their children's mental development and return reports for full efficiency. This will also turn the technology addiction of today's children into a useful resource rather than demonizing the technological developments. Since robots are capable of working 24/7, parents do not have to adjust their lifestyle to a human child development service worker. Parents also do not have to worry about the safety of their children as they would with a human assistant, considering the high number of child abuse by stay at home nannies.

With the correct adjustments, Roboteach can also be used in classrooms to help the teachers.

Goals of Roboteach

- **Teach Different Languages**
- **Nurture Compassion and Empathy by mimicking the child's reactions.**
- **Provide Growth Reports for parents' analysis**
- **Educate in a Fun Way by engaging in games**
- **Develop Communication Skills by interacting with the child**

Analysis of the Profitability

Net Present Value and Internal Rate of Return, in short NPV and IRR. The main idea of NPV is very simple: time is money! The NPV or ("discounted cash flow") methods takes the time value of money into account, by:

- Translating all future cash flows (benefits) into today's money
- Adding up today's investment (cash outflows) and the present values of all future cash flows

If the net present value of a project is positive, then it is worth pursuing, as it creates value for the company.

So, first we need to calculate the Present Value (PV) of the project.

For first year → $PV = (1.000.000 \text{ PLN}) / (1+10\%)$

For second year → $PV = (1.000.000 \text{ PLN}) / (1+10\%)^2$

For Third year → $PV = (1.000.000 \text{ PLN}) / (1+10\%)^3$

For Fourth year → $PV = (1.000.000 \text{ PLN}) / (1+10\%)^4$

The NPV = 1.974.959

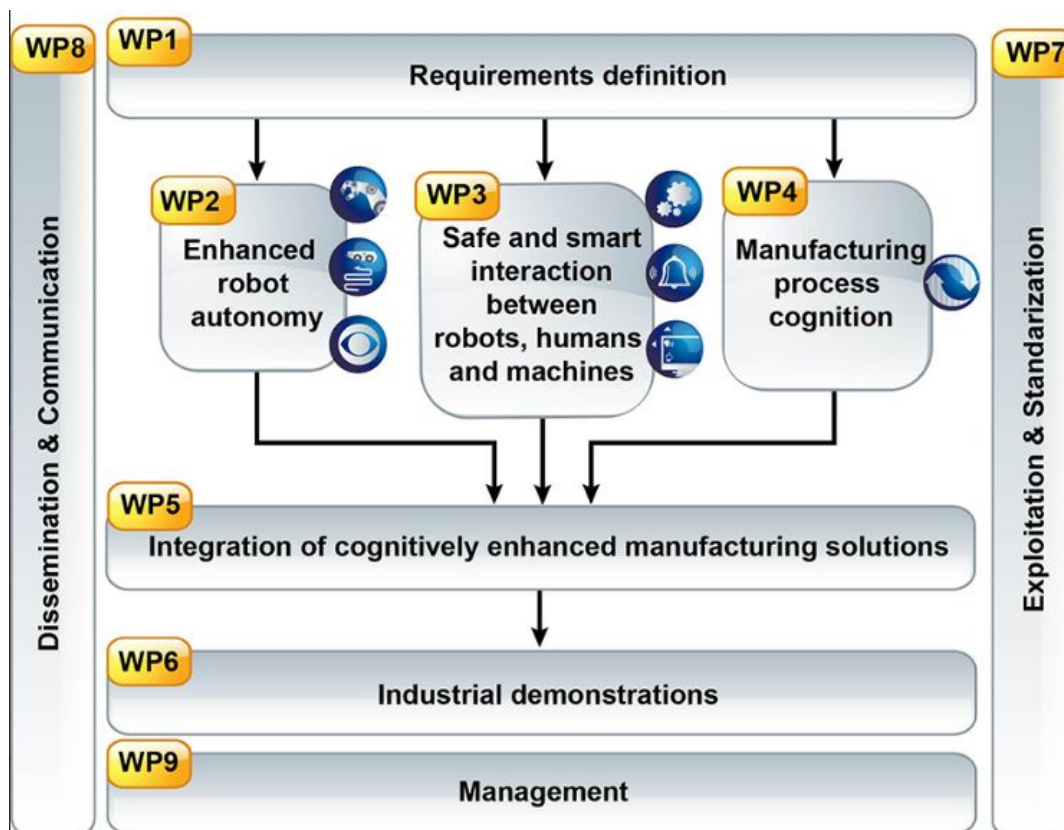
As the NPV is positive, it is worth pursuing, as it creates value for the company.

Net Present Value					
Discount Rate	10,0%				
Year	0	1	2	3	4
Discount Factor	1,00	0,91	0,83	0,75	0,68
Undiscounted Cash Flow	(1.000.000)	1.000.000	1.000.000	1.000.000	1.000.000
Present Value	(1.000.000)	909.091	826.446	751.315	683.013
Net Present Value	1.974.959				
Discounted Value	-	90.909	173.554	248.685	316.987

Preparation of the Project

I. Work breakdown structure

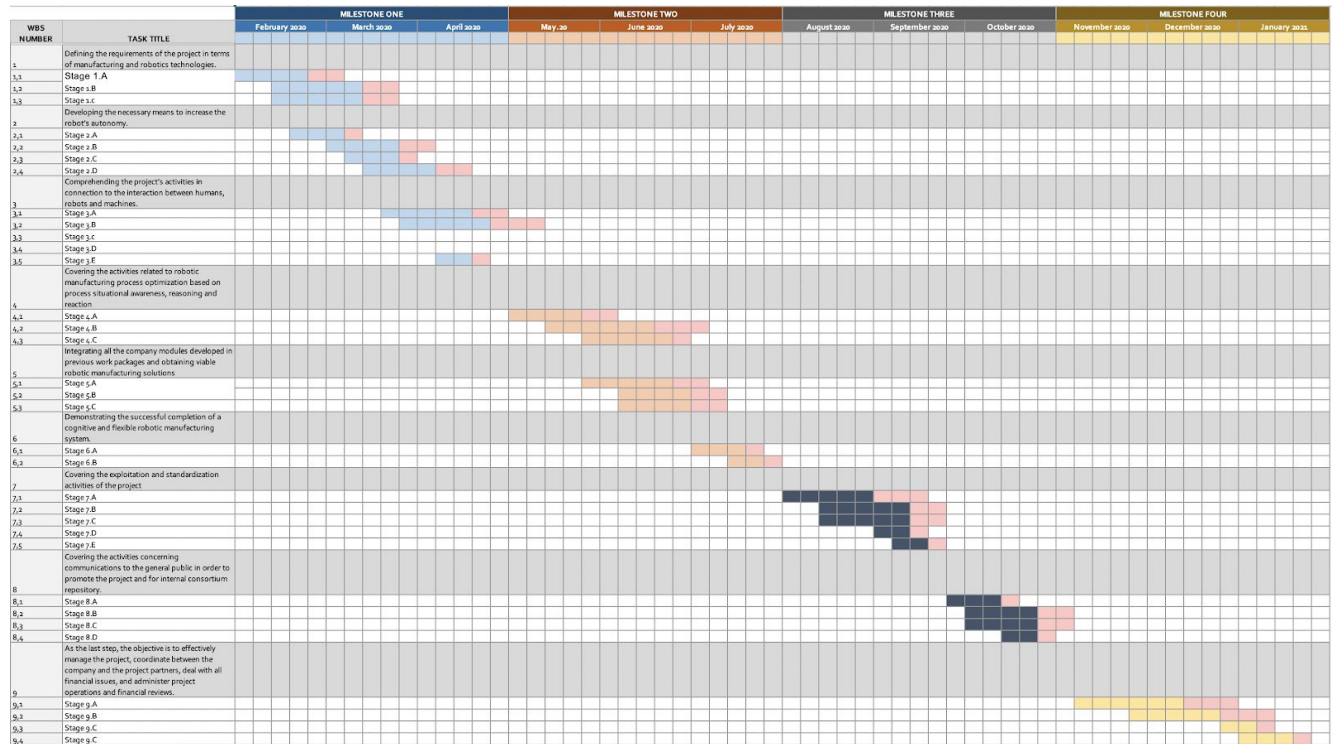
The work will be divided as following in our Robot Production Company for the development of Roboteach:



II. Assets and Resources Description

Since the company is already established as a smart gadgets & robotics company, the company's natural income from previous sales and already existing resources will be used.

III. Gantt Chart and Critical Path Analysis



IV. Budget, category oriented and period oriented

The goal of budget management is to control project costs within the approved budget and deliver the expected project goals.

Total Budget is divided into 3 sections:

	Price (PLN)	Description
Salaries	520408	
Implementation of a Production System	0	Company will use its already existing system.
Importing Parts for the Robots	474359	Average price for the total of the needed parts.
Total	994767	

V. Human resources – Man Months with wages of employees

Calculation of Man Months based on these assumptions:

- There will be 52 Saturdays and 52 Sundays in the upcoming year therefore 104 weekend holiday days.
- The national and statutory holidays total in Poland are 13 days per year, and an additional 2 days are for company off days due to company-wise celebrations.
- Paid vacation leave for companies in Poland are approx. 20-21 days for employees if the employee has been employed for less than 10 years, and 26 days if they have been employed for more than one year. Since this is a company which is younger than 10 years, the paid vacation leave is set for 21 days per year.
- Our company usually gives a one year timespan for projects and this project is no different.
- Each employee who works in this project has a one year contract, which may be renewed.
- The working days are 8 hours.

	Days	Hours (based on 8 hour working day)
Annual	365	
Less weekends	-104	
Net	261	=2088
National/statutory holidays, etc.	-15	
Annual vacation	-21	
Annual sick days	-15	
Holidays total	51	=408
Annual net productive time	210	1680

Salaries of Key Employees

Below salaries are calculated based on the national average.

- Salary for Robotics Engineer (annual): 126,883PLN

Hourly Personal Rate = Annual Salary / Productive Working Hours

126,883PLN / 1680 h = 75.5PLN/hr

- Salary for Robotics Technician (annual): 66,500PLN

Hourly Personal Rate = Annual Salary / Productive Working Hours

66,500PLN / 1680 h = 39.5PLN/hr

- Salary for Sales Engineer (annual): 105,600PLN

Hourly Personal Rate = Annual Salary / Productive Working Hours

105,600PLN / 1680 h = 62.8PLN/hr

- Salary for Software Developer (annual): 152,362PLN

Hourly Personal Rate = Annual Salary / Productive Working Hours

152,362PLN / 1680 h = 90.7PLN/hr

- Salary for Robotics Operator (annual): 69,063PLN

Hourly Personal Rate = Annual Salary / Productive Working Hours

69,063PLN / 1680 h = 41.1PLN/hr

Total budget of salaries for the lifespan (1 year) of the project = 520408PLN

VI. Description of positions needed, together with competences description

• *Robotics Engineer*

Job Description : Responsible for designing, testing, and building robots that are productive and safe to operate as well as economical to purchase and maintain. Engineers will use computer-aided design and drafting, and computer-aided manufacturing (CADD/CAM) systems to perform their tasks.

Competencies:

- ☐ Excellent interpersonal, verbal and written communication skills
- ☐ Proven ability to develop mechanical and electrical systems
- ☐ Proven skills in writing software and programming systems
- ☐ Proficiency in drafting programs such as AutoCAD

• *Robotics Technician*

Job Description : This position is seeking a detail oriented person to perform electro-mechanical assembly, test, and troubleshooting of our robotic systems and associated hardware. The technician role is a highly flexible role that involves production and repair work on robots as well as a wide variety of other tasks in support of engineering, operations, facilities, materials or shipping and receiving.

Competencies:

- ☐ Familiar with manufacturing quality systems
- ☐ Attention to detail and personal neatness / organization
- ☐ Ability to work in a team
- ☐ Strong verbal and written communication skills required, and customer interface ability is desirable

● *Sales Engineer*

Job Description: Helping customers evolve their lifestyle through the use of the Roboteach Robotics tools and services. Guiding customers as a subject matter expert from initial product demos through implementation. Will also be in contact to hire and make a deal with an advertisement company to advertise our new product.

Competencies:

- ☐ A “get it done, whatever it takes” attitude
- ☐ Understanding of software architectures
- ☐ Experience preparing and delivering technical pitches with technical sophistication
- ☐ Strong technical foundation and understanding of various robotics technologies, bottlenecks, and processes

● *Software Developer*

Job Description: Developing, implementing and adapting software for robotic navigation for the Roboteach Child Development Robot. Designing and implementing path planning for modular home robots. Developing, implementing and adapting software for robot manipulation.

Competencies:

- ☐ Software engineering-related coursework and experience
- ☐ Experience developing software using C++ and/or Python
- ☐ Demonstrated ability to work independently as well as within a highly motivated, interdisciplinary, and multinational team environment

- ❑ Strong analytical and mathematical skills
- ❑ Creativity, Curiosity and Visionary skills will also be useful.

- *Robotics Operator*

Job Description: Inspecting parts to ensure they meet customer specifications. Preparing new jobs by working with the Engineering division to estimate cycle times, create new programs and develop weld schedules. Maintain robotic work cells by performing preventive maintenance, backup programs and maintain a clean work area.

Competencies:

- ❑ Proficient computer skills
- ❑ Blueprint and weld symbol reading and mechanical aptitude
- ❑ CAD/CAM experience and other CNC experience
- ❑ Teamwork
- ❑ Follow work order instruction to complete part processing operation with part counts
- ❑ Understanding of quality program
- ❑ Properly use and care for precision tools necessary to inspect and document the qualifications of the processed parts to their specifications

Risk Management

Risk can be thought of as the product of how likely someone is to be exposed to something bad, a hazard and the consequence which is how bad the outcome will be.

Risk = Likelihood * consequence

Let's look at the different scenario:

Scenario 1:

Hazard here is how much kids will spend their time on playing online games. For example, they spend 20 minutes per day, because the kids don't play very often, the likelihood of the kids don't concentrate of important things will be low which means the consequence of that would be relatively low, So:

Risk = $1 * 1$ = low

Scenario 2:

If the kids are playing more than 20 minutes per day the likelihood of loss some other activity will be higher but kids can do the other activity as well, the consequence might be not too much:

Risk = $3 * 2$ = Medium

Scenario 3:

If the kids spend all of their time only playing games, the consequence will be much more than the other scenario.

Risk = $4 * 4$ = High

Scenario 4:

The robot will malfunction and hurt the kid in some way.

Risk = $1 * 5$ = Low

Risk Matrix: In a risk matrix information about consequence and likelihood can be used to determine the overall level of risk. Risk matrix is basically a table or grid with a measure of likelihood on one side and consequence on the other graded from low to high the combination of the two which is the overall level of risk can be categorized as low, medium or high and color-coded.

Here is a colorful table showing the importance of the risk. (Low→ green, medium→ yellow, high→ red)

5					
4				Scenario 3	
3		Scenario 2			
2					
1	Scenario 1				Scenario 4
Likelihood/ Consequence	1	2	3	4	5