3.1. Information Technology and Computing

In an age of information overload and information explosion, decision makers and researchersrequirea suitableknowledge management system, applicationsof statistical methods and data mining studies toget valuable information to improve the day to day life of the community. Knowledge Managgment (KM) system refer to any kind of information technology system that stores and retrieves knowledge, improves collaboration, locates knowledge sources, mines repositories for hidden knowledge, captures, uses and shares knowledge, or in some way enhances the KMprocess.Haramaya University (HU), in its entire journeys created more than thousands of knowledge in different forms either in printed or electronic format. Huge numbers of data are stored offline in every department, faculty andinstitute, but it is not properly used and remains as grey literature. Therefore, this research is initiated to address the problem of exploring/mining the unique type of data that come frommanyeducational settings, to develop applications of statistical methods, to capture the existing data for institutional knowledge and to put its Management System in place. The main focus areas in this sub-theme are:

- Developing a knowledge managment system:The application of ICT and web technology for creating a suitable knowledge management system for HU;identification and prioritization of knowledge to be captured and preserved in HU and developing a suitable knowledge sharing system for HU;
- Development and applications of statistical methods in any fields;
- Analysis and visualization of data for mining;
- Predicting students academic performance.

3.2. Advanced materials Research and development:

In Ethiopia where 80% of the population lives in rural areas, the major challenge confronting the country is the traditional mode of agricultural systems that are being practiced hitherto. Energy is also scarce and the community depends mostly on fire-woods and fossil fuels for cooking, heating, lighting and cottage industry. Hence, energy problem has contributed to food shortage and curtailed economic development. Environmental pollution is another formidable challenge that hampers the socio-economic development of our country. This is attributed mainly to population growth, lack of proper waste management systems and poor urban planning and other anthropogenic factors. To address these challenges, Ethiopia needs to build institutional excellence in the area of nanotechnology research. Accordingly, we suggest the topic fabrication of nanomaterials (semiconductors, metal chalcogenides, metal organic frame works, conducting polymers, nanocomposites/organic-inorganic hybrids) applications to the followingto be considered for a call for proposal by the coming year:

- Agricultural applications**:** development of novel nanofertilizers,inhancing and sustaining release of nutrients,controlle releaseof fertilizers, reduced leaching and fixation, enhancing plant germination and growth, post harvest technology and food processing, prolonging the post-harvest life of food;
- Application to energy**:** solar cell (substitute of silicon by cheaper nano - materials), improved materials for super capacitors, batteries;
- Applicationto Environment and Monitoring**:** depollution/remediation/detoxificationvia: photocatalysis, sorption/desorption, ion exchange, photodisinfection, sensors and bioremediation.

3.3. Energy Resources Development and Utilization

Energy sector is the engine thatdrives the economic development of a country. It is the key input for technological, industrial, social and economic development of a nation. A rising energy demand, in the face of increasing oil price, natural gas and coal together with environmental concerns in terms of greenhouse gasemission and global warming; lack of alternative energy which has brought deforestation, land

degradation and food insecurity in Ethiopia; all thesehave led to the search of a new technological way of energy utilization.There is a general acceptance for the need to diversify energy supply for confronting these challenges by developing advanced, cleaner, more efficient, and cost-effective renewable energy technologies, including superior and cleaner fossil fuel technologies.Priority research areas are:

- The integration of wind energy conversion systems into electricity transmission networks;
- The design and implementation of small to medium-scale wind turbines for use in remote locations;
- Photovoltaicsand Energy Storage;
- Control system of small-scale off-grid power generation;
- Design model stoves for improvement and minimization of energy usage;
- Method of optimum utilization of available and future energy resources;
- Materials Science for solar panel and wind turbines;
- Biogas Technology: Pyrolysis and Gasification process;
- Biofuels Technologies: Improvement and optimization of existing technologies;
- Synthesis of catalyst for methenation of CO_2as alternative routes to store and transport renewable energy sources.

3.4: Postharvest Technology, Processing and Food Analysis

The Postharvest Management System of agriculture in Ethiopia is in dire condition characterized by poor quality products and huge loss (up to 50%). Research in the postharvest management system shall focus on minimization of the high level loss through adopting/developing improved handling, transporting, processing and storage systems and marketing facilities. Attention should also be given to quality improvement and value addition of the produce through minor processing and efficient utilization of the agricultural output as input to the growing food industry to generate more valuable products destined for local and international markets.On the other hand, the young food industry is in poor shape producing very limited number of low quality products targeted for local market.Research at the University should help tacklethese chronic problemsthrough new product development, improving quality level of existing products to increase competitiveness in international market, and searching for alternative local raw materials. Efforts shall also be made to environmental aspect by way of works onbyproduct utilization, food waste minimization and management. Priority shall also be given to develop the rich and diverse cultural and traditional food processing towards modern cottage industry to increase its role in the national economy and to free the large number of women attached to home cooking.Thus, researches shall focus on the following lines:

- Minimization of postharvest losses and increase value addition of agricultural products;
- Improvement of quality standards of agricultural and processed products;
- Development of new food products, processing technologies and preservation methods;
- Agricultural byproduct utilization and food waste minimization;
- Improvement of traditional food processing methods.

1.5. Civil Infrastructure, Manufacturing and Industrial Technology

Production and Quality Management has been recognized as an important factor in acountry's economic growth. Rapid changes in technology has posed numerous opportunities and challenges which have resulted in enhancement of manufacturing capabilities through new materials, facilities, techniques and procedures. Hence, managing a service/production system has become a major challenge in the

globalcompetitive environment. Production and Quality Management leads the way for organizations to achieve their goals with minimum effort. Equaly, computer aided manufacturing and control system (automation) or robotics is current global trend as it is capable of reducing cost of production, waste, hazard and increase accuracy, productivity as well as process capability in different industries. Attention shall be given for Small and MediumManufacturing Enterprises (SMME) as they contribute a lot in job creation and support to the national economy of a country.Currently, SMME are organized and expanding in Ethiopia on the basis of Agricultural-Economy to Industrial-Economy transformation. Hence, design and renovationof modified, cost competent and demand driven technologies in areas of crop harvesting and after harvest processing as well as construction equipment are highly required in these manufacturing enterprises and markets to gear up the economy. Accordingly, the following Prioritized research areas are included:

- Different aspects of quality & production management of different industries in eastern Ethiopia;
- Reverse Engineering: focusing on biomedical engineering and mechatronics and/or robotics (Automation of systems & mechanisms);
- Adaptive Technology: focusing on agricultural machinery, construction equipments, and appropriate technologies to address local community problem.