Design of a Competency-Based Information and Knowledge Model for a Manufacturing System: Case Study EMU CIM Lab

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ABSTRACT

By increasing demand and industry development throughout the world, the levels of competition among enterprises are growing dramatically. The required capabilities to survive in this competition are the ability to manage and exploit high efficiency from the resources. In order to achieve such purposes, classification of the resources and identification of capabilities as well as competencies are vital.

The contribution of this thesis is developing a competency-based information and knowledge model for intra-enterprise. A capability-based information and knowledge model for Computer Integrated Manufacturing laboratory of Eastern Mediterranean University (EMU CIM lab) has been developed and, for achieving competency-based information and knowledge model the other information and knowledge models (design capability model, marketing capability model, R&D capability model and after sale competency model) of the enterprise with the same approach is introduced.

The study of this thesis is subdivided into three phases, namely; requirement phase, design and development phase and implementation phase. Unified Modeling Language (UML) employed as the modeling language.

Finally as output an architecture for a capability analyses tool is designed which is used for decision making within enterprise for product and outside in market.

Keywords: capability, competence, competency model, Computer Integrated Manufacturing, information and knowledge model, manufacturing data model, enterprise integration.

ÖZ

Talep ve sanayi gelişimi dünyada arttıkça, kurumlar arası rekabet de artmaktadır. Bu rekabetçi ortmada barınabilmenin yolu ise iyi yönetim ve kaynakları doğru kullanma ile olur. Bu amaca ulaşabilmek için kaynakların sınıflandırılması ve kapasitenin ve yeterliliğin tanımlanması büyük önem taşımaktadır.

Bu tezin katkısı, yeterlilik-temeline bağlı detay ve iç-kurum bilgilerini geliştirmektir. Kapasite-temeline bağlı bilgi ve Bilgisayar Entegreli İmalat Laboratuarları, Doğu Akdeniz Üniversitesi'nde yaratılmıştır. Kurum aynı yaklaşım ile Yeterlilik-temeline bağlı detay modeli ve bilgi modelinr göre (tasarım kapasite modeli, pazarlama kapasite modeli, R&D kapasite modeli ve satış sonrası yeterlilik modeli) tanıtılmıştır. Karar verme mekaniması yeterlilik analiz gerecine göre mimarisi tasarlanmıştır.

Anahtar kelimeler: yetersiz, yapabilirlik, yapabilirlik modeli, Bilgisayar Entegreli İmalat, Bilgi ve Detay Modeli, Şmalat Veri Modeli, Kurum Entegrasyonu

To My Family

تقدیم به پدر و مادرم

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Chapter 1

INTRODUCTION

Now days, global competition force corporations for innovation, where having appropriate competencies is a key successful factor between competitors. On the other hand, huge increase in the number of competitors provides a wider range of opportunities for the consumers. Therefore, the paradigms that contribute to the highest levels of successfulness in this area are crucial and vital. Manufacturing enterprises are trying to develop its product for respond to customer required by using wide range of information and knowledge. Information and knowledge modeling is a well-known paradigm for enterprise data management system and is a good attempt on breeding enterprise data base schema. For better decision making and to capture competitive advantages, the enterprise need to store, manage and have access to their information and knowledge simultaneously. From this point of view, enterprises need to develop a powerful database system for store and manage their information and knowledge.

1.1 Objective of Study

The aim of this thesis is to provide a competency-based information and knowledge model for intra-enterprise. Indeed, first, based on previous introduced capability model (Guerra-Zubiaga and Young 2008). A capability-based information and knowledge model for Computer Integrated Manufacturing (CIM) laboratory of Eastern Mediterranean University (EMU CIM lab) is constructed. Then, for achieving competency-based information and knowledge model four other information and knowledge models (e.g. design capability model, manufacturing capability model, marketing capability model and research and developed model) of

the enterprise with the same approach is introduced. An architecture for a capability analyses tool is designed for implementation phase which is used for decision making within enterprise and outside in market.

1.2 Research Methodology

The research methodology of this thesis is subdivided into three phases, namely; requirement phase, design and development phase and implementation phase. Unified Modeling Language (UML) employed as the modeling language. The requirement phase consists of three types of diagrams namely: use case-diagram which introducing the system in high level of communication, sequence diagram which show how the processes is working and activity-diagram which illustrates the whole stream of the system. The design and development phase deals with identification and classification of information related to resources and processes and corresponding knowledge. Appropriate class diagrams and object diagrams are required in this phase. For implementation phase, based on out comings of the previous phases a tool is developed for decision making.

1.3 Thesis Organization

In Chapter 2, the literature review maintains a background research for this subject including some description form different point of view.

Chapter 3, by making some basic definitions in fact created the clear aspect for entering into subject.

Chapter 4, which is the most important chapter of this thesis, it consists all of the performed case. And at the end of the chapter we made a new tool for competency modeling.

Chapters 5, consists of conclusion and summary of the thesis.

Chapter 2

LITERATURE REVIEW FROM ORGANIZATIONAL MANAGEMENT POINT OF VIEW

2.1 Concept of Strategic Management

The comprehensive streams that support almost all the functional and technical aspects of the organization are Strategic management. It is a pillar concept of management that comprises all such functional fields as marketing, finance and bear attention to human resource, production and operation to a critical ground in management discipline.

Therefore, in order to achieve organizational success strategic management has crucial contribution than any specific functional role, there is a quite big difference between strategic management and executive management. Strategic management deals with threatening issue and ascending executive grounds in the organization whereas executive level management deals with the particular level of the business. What stands as one of differences between strategic management and executive management is that strategic management has extended focus unlike executive management. In strategic management process, high level managers such as Chairman, Managing Director, and corporate level planners are more indulged but in the other hand executive management fields concerns more functional managers and other employees.

Strategic management put forward the method, approach and technique to set vision, mission, objectives, and strategies that can be the conductible boarders to design

functional strategies in other related functional areas. In light of that, it is top-level management that craves the way for other operational management and acts like a light house in organization. Excel or failure of the organization is determined by strategic management. That is why strategic management is very important as it espouses and set guide like for all the functional areas of the business. It is a common assertion that businesses which adopts or make formal strategic management systems have higher success opportunities than those which did not adopt one. Strategic management allows firms forecast problems and opportunities in the attainable future sight. It set a conceptual prospective regarding vision, mission, objectives, and strategies that insure a secured future for the organization. ”Strategic management is defined as the art and science of formulating, implementing, and evaluating cross-functional decisions that enable the organization to achieve its objectives.” (Hafis and Thomas 2005) Generally, strategic management does not only consider a one specialization but wrap cross-functional or the organization as whole actions and decisions are fundamental pillars of strategic management. It is a constant mechanism in which high-level managements formulate a suitable decision for the organization. It guides to the best possible strategy so that organization could have a comparative advantage on others to attain a supreme presence in the competitive business environment. Thus, strategic management is a way where a strategy recognizes organization current stage and where it aims to reach. The gap between desired and possible is known as performance gap. The identification of the performance gab is made possible during strategic management process as well attempting to reduce the performance gab is being aimed. Sometimes, the performance gap can be positive too (Hafis and Thomas 2005).

2.1.1 Strategy as Constructive Force in Competence Advantage

In competitive advantage most of the focus is on the strategy. The previous research of the strategy concept (WernerFelt 1984) as well as the more recent Resource-based view of the firm (Wernerfelt 1984) all propose the necessity to mop resources to environmental opportunities. The way the organization approach that is the vertebral bone of strategic management. Resources which grant competitive advantage should be hard to imitate. Managers construct uniqueness without a clear sight of what kind of product trait can lead to success. They take a leap of risks and in so doing such dare decisions their intuition is at least as important as their analytical skills. Building unique resources requires awareness to intermediate processes and both to their resource composition and their response to market demands (Ray, Barney and Muhanna 2004).The clear understanding of the firm's functional characteristics and its inter relationships facilitate the building of a competitive advantage. This leads to the value chain configuration (Porter 1985).This suggests (that integrated activities in business functions level and business is request of competence advantage).The concern of the business level is about to find a posture position among competitors, in the other hand, the functional level is focused on the efficiency of the productivity and organizational overall effectiveness. In light of that, one can talk about a functional strategy as an endeavor to actualize at its level the stated corporate values. For example, the financial flexibility is a targeted aim of financial strategy, while HRM may be prior concern revolves about hiring and enhancing the operational flexibility (Hafis and Thomas 2005).

2.2 The Importance of Core Competency

There are many competitive opportunities that allow some areas of a company to be able to move its technology from one order to another. By developing of the company's capability, it can be ready for change resources from one business area to

another. It is important responsibility of the management to motivate the organization with a view of different purports and guide them to reach the gold (Hamel and Prahalad, 1990).

The way how core competency is made is necessary in advantage building because product-price-performance and tradeoffs make the advantages. An organization's management should combine the technology and product skill of company into competence that can adapt quickly any advantage to change business. the competencies are the nourished core products for make business whose result of them is product. But here there is big question how it is possible to identify core competencies in an organization. Three methods we can introduce: first core competence make contact to a different markets. Second it should make clear conception of end product to support customer benefits. And finely core competence shouldn’t be easy for imitate. Core product makes a physical connection between introduction core competence and end product.

The organizations should make or choice flexible strategies for long unpredictable way in competition area. Most of the research on competence advantage is around core competence as main source of advantage.

Core competencies include the particular “set of skill and resource of firm” possesses as well as the way those resource are used to product outcomes. The managers and scholar focused to make clear aspect of core competency as necessary element for start organization and important case for changing strategic (Fiiol 2001).

The concept of core competency is difficult to describe in empirical area but scientists recently have identified this problem in some description. Scientist has recently identified some solutions regarding these problems in general conceptual discussions (Hafis and Thomas 2005) and in core competence-specific empirical research (Wang, Hing and Yang 2004).

The conception of core competence, interests for managers and scholars, as basic point to organic restoration and as a sponsor for strategic change. It is a difficult for description, understanding, and use in practical phase. Researchers recently mention to this issue by generic interlocution.

2.2.1 The Concept of Core Competence in Empirical Research

As the competition takes increasingly dynamical growth along with its turbulent nature, there is a strong affinity to comprehend firms in terms of the effective use of unique capabilities that allows long lasting performance that is differentials within industries. So contemporary management turns a great deal and focuses on development and enhancing effective methods of knowledge flow and management along with the intangible resources available. Therefore, a significant scope and attention has been turned to the resource-based prospective and its accompanied contributions in both academic as well as practical molds (Montgomery and Wernerfelt 1988), (Hamel and Prahalad 1990), now and; (Barney, 1991), (Teece, Pisano and Shuen 2004), (Eisenhardt and Jefyey 2000) Conversely, few pragmatic studies have looked forward to separate the various sources of topmost firm performance in terms of several un similar elements of core competencies. In fact, few in depth studies has found to examine the main constituents of core competencies and their different influence and effect on general firm performance that counts the financial perspective, internal process and marketing. moreover, the

thing which still remains as un resolved mystery are relation between core competencies, environmental disturbance and firm performance, with little research on empirical bases done to see how is the influence of environmental disturbance moderates core competencies influence on firm's performance and activity. Such research needed to reach an in-depth understanding of what way and why core competencies have noticeable add to firm performance in conditional contexts. The driver key behind firm differences shall be seeded by comprehending the differentiate firms from each other in terms of the core competencies which mainly constitute the firm, instead than by considering the effect of the industry. And big emphasis shall be made to deduce the differences in firm activity in terms of emerging from a different kind of sources accrued from firms rent, in which management of strategic resources and controlling they have effect especially on core competencies (Winter 1995).

For identifying of core competencies it is necessary to consider the critical point of resources, capabilities and competencies. As a concept of this there is practical example to show the importance of core competence: for become success between competitors they are many things that firms couldn't found them. In some decade many managers evaluated their capabilities for help to corporation. but In the 1990s, they have been evaluated that capability to recognize, nurture, and make use of the core competencies which allowed development within reach , the concept of the corporation itself shall be rethought, For example (Hamel and Prahalad 1990) in Take in consideration the previous decade of GTE and NEC. In the early 1979s, the development of information technology industry by GTE was well known and recognized as dominant player in such industry. It had high activity in telecommunications field. As well GTE's companies of entertainment product group

have been producing colored TVs and had a stage in visual or displays related technologies. In 1980 this company has 9.87 pound billion sales, while the net cash included in this company was around 1.6 billion pound. Other hand, NEC was considerably smaller, which was £3.7 billion in trades. It had an equivalent industrial productions and computer of business uses but, with an inadequate experiment in running telecommunications company. Even though this was the case but NEC had superior success in 1988. As brief account regarding those two companies in succeeding years GTE became an operating telephone company with a good weight and production in defense and lighting goods. But in global term its business was small. GTE has devised Sylvania TV and Telnets, switching installing, in ventures cooperative, and shut down semiconductors. As a consequence, the GTE's international situation was eroded. In light of that the Non-U.S the amount of profit, between 1980 and 1988 shows five percentage fall. NEC is a leadership manufacturer in semiconductor and have significant role in producing telecommunication and computer related products in the world. The main core competency of this company is computer processor related products, for avoiding expands this company try to be fare form switches as well as transmission. And so to find NEC as the only company among top 5 in harvesting revenue out of telecommunications, main frames and conductors. The question which arise here and force itself, why did these two companies perform so differently, even though both started with similar business portfolios? The answer is mainly because NEC recognized of itself ‘‘core competencies,’’ and GTE failed in recognizing the Core Competencies. In early 1960s the JVC’s decided to seek the improvement of a videotape competence and it had went and fulfilled the three tests out lines here, and it can be found also RCA’s decision to improve video product system did not work. Little corporations can be found that has been able to be leadership globally in more

than five or six fundamental competencies. It’s also hard to find company produced list of core competencies in case it’s containing a list of 19 to 29 capabilities but, it is most perhaps a fine stream to produce a list of this and to observe how these “capabilities” can aggregate, as Foundation. This resort in promoting the research for licensing agreements and allies in what corporation man attain the missing pieces, at a low cost. The General of western companies do not dare to consider competitiveness in such terms. In this case it is worthy to take a rigid-consideration at the risks they are encountering. Corporations that critic and evaluate competition of their own as well as of their rivals, in level of the expense or efficiency of the final products are just facilitating of the wearing of “core competencies” away or hardly able to enhance them. The potentials hidden and unseen skills that are amount generation of competition in yields terms, cannot be ‘‘borrowed’’ by out reaching. In Frahalad and Hamel view, from what they have observed, many companies unintentionally give in core competencies when they stop the internal investment, in believe it just "cost centers" to be coherent with the suppliers. Since the infrastructural technologies transformed or while the company decides to paradigms as a competitor in the global market the product life cycle as well as the product development life cycle would be considerable. In each phase of this life cycle also taking consider all the resources is vital but on the other hand capability as well as competency even at the higher level of abstraction core-competency of the organization is very important from organizational management level and from information and knowledge modeling points of view.

2.2.2 Core Competencies for Achieving to Core Products

A core product is physical link between recognition core competence and end product. By some example from famous companies try to make concept of core product.

Toyota's engine, for instance, is a core product, among development skills and design that finally guide to create of final yield. "Core product" is the part or component that in fact helps to the value of the final yield. The core products cause those corporations more thinking about brand share for reach to end product markets. (For example market is, 40% of the U.S. refrigerator) and the manufacturing share it reach in any specific core product (such as, 5% of the world share of compressor manufacture).Canon is famous to have an 84% world output share in desktop laser printer ''engines,'' even although its brand divide in the laser printer business. Also, Matsushita has a global manufacturing share of about 45% in key VCR parts, far in over plus of its brand share (Panasonic, JVC, and others) of 20%. And Matsushita has a leadership core product share in compressors world-wide, predictable at 40%, even though its brand share in both the air-conditioning businesses and refrigerator businesses are totally small. It is necessary to show this distinction between end products, core competencies and core products, because world competition is played out by diverse rules and for various stakes at each level. To champion leadership over the long term, a firm will perhaps be a victor at each level. At the level of core competence, the purpose is to make world leadership in the development and design of a special class of produce functionality be it well set data storage and recovery, as with Philips's optical-media competence, as with micro motors and microprocessor controls of Sony .In order to be stay as a leader ship in the chosen core competency, these firms trying to share the maximum amounts of their core products. The production of core products for global and or local market will cause to take the world wild market requirements, this feedback effects the future core products also these kinds of feedback for firms motivates the firms to produce customized products. For instance Canon as a firm which have core product namely camera, when this company getting market feedback from global market it may decide to

produce new type of camera for its consumers on the Europe aria because of the regional wither situation. As another example Toyota as a leader ship in car manufacturing based on the feedback's of the consumers which they are locate on Arabic countries decide to produce new type of Land cruses which also are not very petrol economical but contain a huge body.

2.3 Competence

The competence subject started to appear in the early1990s, the many description was introduced from scholars which have constantly mentioned to many basic foundations of this subject. Like relationships, "skills", organization, "capabilities", learning, and "knowledge" (Teece,1993, Prahalad and Hamel, 1990, Leonard-Barton, 1992 Schoemaker,1999;).so, we try to take the several conceptualizations advised by scientists which help to make clear feature of competencies and how those be recognized in a special corporation. below We can see three cause of this confusion:

(a) Usually put diverse definitions for same understanding;(b) Mention to root diverse terms of actions within structure;(c) Usually reconcile a static vision of "competences" which didn't have enough study about how can make or transform it inside an corporation.

Description of competence in holistic, systemic, dynamic, and cognitive levels is necessary. The initial study to propose a complete terminology for definition "competences" was accomplishment by (, Hubertus M and Heene 1996), Suggest a working description of competence is the capacity to hold the organizing deploy of "assets" in methods that useful for corporation to reach and achieve its goals. Although, this description expresses necessary features of the four bases of competence theory, that want to identify and take the holistic nature, cognitive,

dynamic and systemic of organizational competences. For start step, competences should have capacity for answer to the dynamic nature of a corporation's exterior environment and interior operations. Second step, competences should contain a potential to manage the organizations systemic nature and of their relationship with other organizations. Furthermore, competences contain accessing and organizing, main corporation to all the assets that are outside the borders of the corporation. Financial institutes, clients, materials and components suppliers and consultant's providers are amount for availability of assets. Third step, competences should contain a potential to manage the cognitive procedures of an organization. Fourth step, competences should contain the potential to manage the complete nature of an organization as an open system. So, the description of organic competence identifies the being of multiple investors and the expectations of all suppliers of necessary "resources" in hold the value-create procedures of a corporation.

2.4 Making Organizational Capabilities

Corporations are forming within make behavioral borders and physically that include a collection of informally or formally specified relation. The physical boundaries is important since place of everything is inside it; most important, but, is the behavioral scope since that carries feeling, conversations, and interaction between human agents. Inside of resource-based strip of argument, corporations are viewed as a set of several types of resources. Financial resources, technological and human patents, databank, etc., establish an array of what a confident company owns in terms of properties to be exploited. All these different assets, but, are typically loosely linked with each other. Each of these assets brings with it a confident potential of changeable amount and character to be use by the corporation. Totally, they constitute an area of potentialities, that is, nevertheless, rarely completely exploited because these properties are insulated either physically (e.g. inside the limits of

diverse functions or departments) and/or artificially (because of political aims, power, without communication etc.) from each other. But their being included inside the same, generally interpreted, behavioral area, and physical. They are not essentially connected to one another to take benefit of the synergies that may appear by their working each other (Spanos and Prastacos 2004).

Resources can become competencies if their loose "coupling convert to structural coupling, that is, when they are consciously carried each other to form socially intricate processes to do definite duties". Or we can say, discrete resources will become competencies just when the, behavioral spaces and discrete physical that include them are organically connected to figure an allied, behavioral subspace, or well, a "place" that brings their reaction. In the architectural works, place means is a ownership of space, a certain portion of space. A place makes an "inside-ness" in fact that means is "gathers" what is to be its fundamental attributes are thus concentration and enclosure. In this place, the reaction between assets most especially human assets are focused and amplified and at the same time bounded and constant to create new knowledge requests (Nonaka and Konno 1998).Corporations compete not on the foundation of same resources, but on the foundation of whether their resources can be active to meet same customer requests. Justas Levitt's contribution permissible managers a extensive revisal of the business chances. for consider dynamic competitive environments in fact, every concept is acknowledged to be remarkable enough to have its own main research stream of strategic management scope, that means is, the base of competence, resource and dynamic resource although integration the associated concepts is infrequently defensible, it usually creates sense to unique them by founded streams (Peteraf and Bergen 2003).

2.5 Over View of a Dynamic Capabilities Approach

The competition in high level of technology industries such as information services or software makes this question that how achieved advantage should be achieved hard to answer so because of this, big companies should follow a 'resource based strategy' of collection important technology assets often protected by attacking intellectual property situation but this strategy usually not enough to support an important competitive advantage .Winner firms that can show timely reaction and quick and flexible produce innovation, with the management capability to effectively guidance and change location of external and internal competences.

Industry observers suggested that firms can store large collection of valuable technologies that still not have more useful capabilities. We use of this ability to reach to new competitive advantage as 'dynamic capabilities' for emphasize of two key feature that were not the focus of notice in preceding strategy perspectives. The term 'dynamic' used to the capacity to restoration competences to be flexible in changing business: so in some critical situation in markets we need to technological change very fast because the situation of markets and competition is unpredictable in future.

The length of 'capabilities' must focus is to introduce key role of strategic management in suitably adapting, integrating, and reset external and internal organizational resources, and functional competences to adapt the provisions of a changing environment. One of the big Concerns of any firm in competition is how to make difficult to imitate of external and internal competences or how can support their valuable product. So according to argue of (Dierickx and Cool 1989), how much you consider to spend (invest) on various possible areas are reference to the firm's strategy. However, decided about areas of competence are influenced by past

decision. In any situation corporation should follow certain route of competence development. This rout is not just say what is best choice for firm today but it also defines areas around what its internal selection is probably to be in future.

Therefore, corporations, at diverse points in time, make long term, quasi- unchanging commitments to certain areas of competence. The concept that competitive advantage need to be both the exploitation of accessible external and internal corporation specific capabilities, and developing new ones is partially developed in (Teece, Toward an Economic Theory of the Multiproduct Firm 1982) and (WernerFelt 1984). However, only a moment ago have scholars begun to focus on the details of how any organizations. First develop corporation-specific capabilities and how the restoration competences to adapt in change of business environment. These issues are depending to the corporation's business processes, development routs and market positions. Many writers have present in how corporations can develop their capabilities to adapt in business environment sudden change. The purpose of dynamic capabilities is providing a coherent framework that can integrate available conceptual and experimental knowledge, and facilitate prescription. It builds according to theoretical basics that made by, (Penrose 1959), (Winter and Nelson 1982), (Teece, Pisano and Shuen, Dynamic Capabilities and Strategic Management 1997). This literature review was from organizational management point of view that help to make based back ground of fundemental functions in any enterprise to make core competency hierarchy.before some scholars have been researched for make core competency hirarchy but nobody did make competency model for an enterprise.in this thesis we make competency modeling for case study according to core copmpetency hirarchy.

Chapter 3

COMPETENCY AND CAPABILITY: CONCEPTS FROM COMPUTER SCIENCE POINTS OF VIEW

3.1 Core Competence

The result of core competencies is core products. Core products are not sending directly to customers but they are used to manufacture most of end products. There exist a tangible link among core-competency of the organization and the products which that organization is producing, this link express as core-product. They are help to increasing of value in end product. Imitation of core competencies is difficult for competitors, but if one of the core competencies is destroyed it wouldn't be easy for it to be replaced. In fact they are the source for improved value of product for sailing it to customer **.**There are many definitions of core competencies for example: (1) the collective acquisition in the structure, especially how to harmonize the various production skills and integrated multiple streams of technologies (Hamel and Prahalad 1990).(2) Intangible resources are difficult to be imitated by competitors however they would not find it easy for replacing in critical situation.3. A distinctive compound of skills, knowledge those are possessed by one corporation in the market.4. Core competencies are "skills and areas of knowledge that are shared across business units and results from the integration and harmonization of SBU competencies" or core competency includes many competencies that are distributed in the company (Javidan 1998).

3.2 Definitions of Competence

A competency of corporation is any ability that can be distinguished between competitors. Competencies increase values, because they develop the borders of capabilities. In fact have accurate analysis of resources, capabilities and competencies help us in conceptual understanding of competitive advantages.

There are many definition of competence from scholars. For example a competence described as “a cross-functional integration and co-ordination of capabilities” or as a set of skills and knowledge. The other researchers are believe that competence is “an ability to sustain the coordinated deployment of assets in ways that helps a firm achieving its goals” (Sanchez, Understanding Competence-Based Management: Identifing and Managing five Model of Competence 2004) ,In another definition competence is introduced as “reference to a quality is inherent in individuals or teams of individuals, a quality that develops and refines something (e.g. capabilities, resources), occasionally to a visionary end (e.g. to generate sustainable profits” (Urban 2007).

According to (Urban 2007) any competence has bottom three attributes we can take it as a core competence:

(1) A core competence should help us to improve benefit of product for customers.

(2) A core competence must be qualified for competition for example it shouldn’t be easy for imitating

(3) A core competence must make a good situation for access to all kind of markets.

3.3 What is a Capability

Capabilities referral to the company's ability is to use its resources. They include a "chain of business processes and routines that manage the interaction between its resources". A process is a collection of activities that convert an input into an output. Such as, a corporation's marketing capability can be based between different things on interacting between its manpower (marketing experts), technology (computer software and hardware) and financial resources. Being functionally based is the individual aspect of capabilities. The area of a capability is a particular function. For example, there are production capabilities, human resource management capabilities, marketing capabilities, logical and distribution capabilities. Indeed capability is functionally based, but does not preclude it for the use of resources that may be across the corporation. For example, Intel's marketing capability is very much linked to its overall company's illustration, so the most effort of its marketing strategies is to get advantage of the corporation's reputation (Javidan 1998).

A confusing feature in concept of capability is having two based meanings. Number one is capacity that confirmed in javidan article. The Grant is explained capability as "the ability for a group of resources to do some job". Number two is coordination that includes a combination of tacit knowledge, organic memory and routines (Nelson 1982).Contemporary study introduces outstanding capabilities as being dynamic capability but we can consider capabilities from two viewpoint.Operational capabilities consist of all the quotidian activities during a process such as manufacturing, but dynamic capabilities make, integrate, and reset operational capabilities (Teece, Pisano and Shuen, Dynamic Capabilities and Strategic Management 1997); (Eisenhardt and Jefyey 2000).Knowledge is prepared in a facility knowledge class which is divided in to resource knowledge and process knowledge.

3.4 Definition of Resource

In competencies we can know resources as “building blocks”. They are the measurement criterion for determination of organization’s value. According to Barney there are three kinds of resources: physical resources like equipment, asset and plant. Human resources are experience, management team and training and organizational resources like reputation or culture. On the other hand there are resources divined to be tangible and intangible. Some of the resources are physical and tangible like equipment or plant and another are intangible like brand name. Each firm has a package of resources, but just some of the corporations can have a maximum efficiency of their resources.

How leverage in resources is different between companies, in fact capabilities refer to the company’s ability to exploit of resources.

The basics of organizations are resources, since they know it is an input value process (Grant 1991). The factor of sustainable competitive advantage is the resources, as if they have the same properties such as rate, inimitable, and non-substitutable (Barney 1991).

From empirical study’s view, product and resource are complementary. Must products need to be serviced from several resources and several products can use these resources. By activity size of corporation in diverse product markets, we can find resources that are in minimum necessary. Conversely, by determining a resource profile for a corporation; it is possible to discover the product market activities. Given corporation more formally, corporation’s resources at a given time could be

explained as (intangible and tangible) finances which are tied semi-permanently to the corporation.

3.5 Some Other Definitions

3.5.1 Asset

Everything that is “intangible or tangible” in the corporation can be used in processing of making and offering its yields (goods or services).

3.5.2 Skill

“Unique forms of capability typically inserted in persons or groups, that are useful for specialized positions or is relevant to the use of a specialized asset”.

3.5.3 Data

Linked just to numbers or words which are related on the context that we used, can also be expressed as information.

3.5.4 Information

Information created by data to present a meaning within a context.

3.5.5 Knowledge

Knowledge has many explanations: when we have knowledge which is able to identify valuable data relationship within our context or we are able to conclude those relationship from raw if it is structured information.

Chapter 4

ENTERPRISE COMPETENCY MODELING

4.1 Background

Types of enterprises depend on the direction of the business activity. This activity depends on the "object of investment and to obtain concrete results". There are many different types of enterprises: industrial, commercial and trade, finance and credit, insurance, and finally intermediary.

Industrial enterprise: Is the process of production of specific products and implementation of the work and services for sale to consumers. Manufacturing business depend upon material sphere. With the national economic point of view of industrial enterprise the most important factor is defining the type of business, as in manufacturing organizations (firms and enterprises) is the production of goods and consumer goods. All kind of goods, works and services for individual consumers (people, business firms and government) are made the subjects of the manufacturing enterprise. In addition every enterprise is multifunctional that means is has many dimensions to deal with.

Since our work will be on intra-enterprise, therefore the intra enterprise hierarchy is going to be taken into consideration. Normally each enterprise consists of many departments and each department has a particular goal that has to be achieved to fulfill the goal of the enterprise. We can take in to consideration that each department of the enterprise is a function. For example we choose an industrial enterprise that

contains four different departments one of them is manufacturing. Let us take department of the manufacturing into consideration hierarchy; this department consists of four levels, factory, shop, cell and station. As stated earlier we consider every department as a function and hence any enterprise that consists of many departments can be known as multi-functional enterprise. Accordingly we will consider a shop level of hierarchy as our case study.

4.2 Scenario of the Case Study

In EMU CIM Lab there are four different scenarios consisting of milling, testing, storing and assembling that will be described later. CIM lab can be seen in Fig 1 above, this includes three cells. One robot is used between every two cell. Every cell has a PC, PLC, controller, robot and a machine tool which do one particular job at a time. All the PCs receive command from host computer that is connected to all of them and all these cells are connected to the PLC. So in this case:

Cell number 1: milling machine, PC, controller and robot

Cell number 2: robot, PC, controller and laser micrometer machine

Cell number 3: robot, PC, ball loader, glue machine and assembling machine

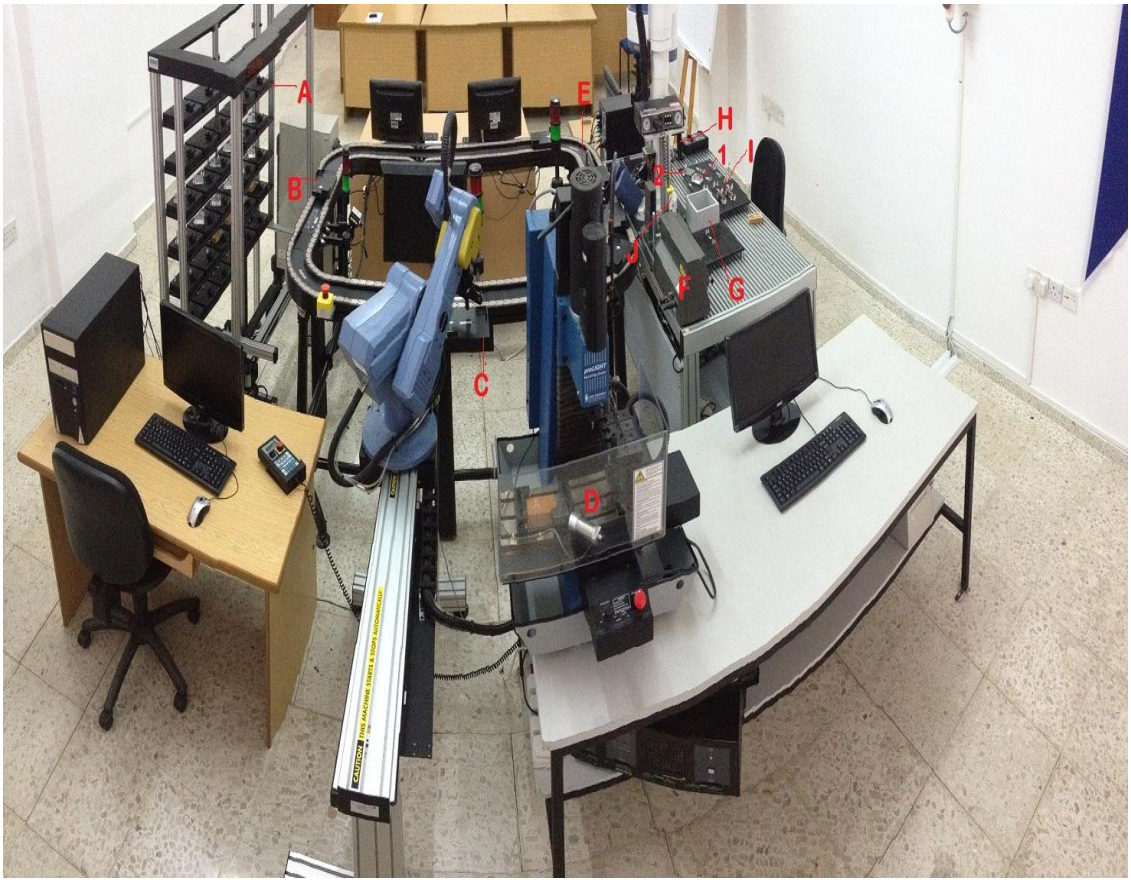


Figure 1: EMU CNC Lab

During this scenario there is a conveyor which transports work piece between cells. All the tools in this line are controlled by program and power is required. There are sensors in front of ever work station so as to receive and send signal (data) to the PLC in order for them to communicate. For preventing the waste of time due to stopping of conveyor in front of every work station, there are some pallets placed on the conveyor so that it can stop at different locations as per the command of PLC without the need of stopping the conveyer.

4.2.1 Scenario 1 (Milling)

The conveyor and pallets starts to move to the first work station namely B location as you can see in Fig 1, when pallet reaches to the first station by means of some magnetic field between pallet and sensors, PLC receive its first signal and then sends back signal for separating the pallet from conveyor and hence after this it sends message to robot. After receiving the message, the robot according to program takes the work piece from the storage and places the work piece onto the pallet. After the work piece has been moved from location A (Storage) to location B (initial pallet position) the robots informs the PLC by transmitting signal to it and then the PLC activates the magnetic field and then the pallet start to move along the conveyer and as the pallet with the work piece reaches to its destination station location C as labeled on Fig 1 above. As soon as the pallets reaches this station a signal is sent again to the PLC which sends back two different signals. One of the signals is to disconnect the pallet from the conveyer and the other is to inform and activate the robot to pick up the work piece from the pallet at station C and place it on to station D which is CNC milling machine. The robot will follow the instruction provided by the PLC and perform its duty by placing the work piece at location D. When the work piece is placed on station D by the robot, it will send signal to the PLC. The PLC will now activate the milling machine. The milling machine will then by receiving the command from PLC will perform its operation. As soon as the milling machine finishes its job it will again inform back to PLC. And then the PLC will activate the robot informing it to transport the finished product from station D to station C. Again after performing the job the robot is going to send back the signal to PLC which in turn will deactivate the pin and hence the pallet would start to move along the conveyer until it reaches station B. As the pallet with the product reaches to its initial destination (location B) from where it started its journey, it is stopped here

where the robot moves the finished product to location A (storage). This is the end of the Scenario Below is the table which describes the positioning of the work piece, the process and the machining involved during the scenario.

Table 1: Scenario of Milling

Position of piece	**Process**	**Machine**
A→B	displacement	robot
B→C	move	conveyor
C→D	displacement	robot
D	milling	CNC machine
D→C	displacement	robot
C→B	move	conveyor
B→A	displacement	robot

4.2.2 Scenario 2 (Assembling)

In this scenario we will be dealing with two work pieces, work piece (1) and work piece (2). The system starts with the first piece. The conveyor and pallets starts to move to the first work station namely B location as you can see in Fig 1, when pallet reaches to the first station by means of some magnetic field between pallet and sensors, PLC receive its first signal and then sends back signal for separating the pallet from conveyor and hence after this it sends message to robot. After receiving the message, the robot according to program takes the work piece (1) from the storage and places the work piece onto the pallet. After the work piece has been moved from location A (Storage) to location B (initial pallet position) the robots informs the PLC by transmitting signal to it and then the PLC activates the magnetic field and then the pallet start to move along the conveyer and as the pallet with the work piece reaches to its destination station location E as labeled on Fig 1 above. As

soon as the pallets reaches this station a signal is sent again to the PLC which sends back two different signals. One of the signals is to disconnect the pallet from the conveyer and the other is to inform and activate the robot to pick up the work piece from the pallet at station E and place it on to station H where four balls are loaded into the work piece by the help of the robot. Then the robot takes this piece (1) to another pallet in assembling area location I. In the mean while work piece (2) is brought to station E by the same process as work piece (1) was brought to location E. Now once again the robot has to start functioning and this time it transports the work piece (2) directly to location I. The robot would now leave work piece (2) here and move to station J where it will pick up the gluing machine and bring it to station I at top of work piece (1) and then it would injects the glue on to the four points where the balls were placed. When the gluing on these four locations is done the robot would then move the gluing machine to its initial destination station J. After leaving the gluing machine, the robot will come back to station I and pick up work piece (2) and place it on top of the work piece (1). Work piece (1) and work piece (2) are now assembled together. This is our new finished product. This newly finished or End product is then with the help of robot is moved to station E. Now once again with the orders of the PLC the pallet would carry our newly finished product from location E along with the movement of the conveyer to station Band the pallet would stop. The robot here would take the End product and put it to location A where it is stored for future use. Table 2 shows scenario 2.

Table 2: Scenario of Assembling

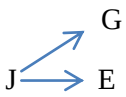
Work Piece number	Position of piece	Process	machine
1	A→B	displacement	robot
1	B→E	move	conveyor
1	E→H	displacement	robot
1	H	Balls loading	Ball loader
1	H→I	displacement	robot
2	E→I	displacement	robot
1	I→J	displacement	robot
1	J	gluing	glue machine
1	J→I	displacement	robot
2	I	Assembling	robot
1,2	I→E	displace	robot
1,2	E→B	move	conveyor
1,2	B→A	displacement	robot

4.2.3 Scenario 3 (Testing)

In this scenario we will be dealing with one work pieces, work piece (1). The conveyor and pallets starts to move to the first work station namely B location as you can see in Fig 1, when pallet reaches to the first station by means of some magnetic field between pallet and sensors, PLC receive its first signal and then sends back signal for separating the pallet from conveyor and hence after this it sends message to robot. After receiving the message, the robot according to program takes the work piece (1) from the storage and places the work piece onto the pallet. After the work piece has been moved from location A (Storage) to location B (initial pallet position) the robots informs the PLC by transmitting signal to it and then the PLC activates the magnetic field and then the pallet start to move along the conveyer and as the pallet

with the work piece reaches to its destination station location E as labeled on Fig 1 above. As soon as the pallets reaches this station a signal is sent again to the PLC which sends back two different signals. One of the signals is to disconnect the pallet from the conveyer and the other is to inform and activate the robot to pick up the work piece from the pallet at station E. For third scenario all the process is same as scenario 2 starting from Location A until location E. in this step robot will take the work piece from pallet and put it on laser micrometer station F. This laser micrometer is going to check the dimensions of the work piece. The laser micrometer has some tolerance value for the work piece. If the work piece lies between the tolerance value then the robot will move it to pallet and then from pallet via conveyer the work piece would be carried to station B and then to station A where it will be stored for further use. In case the work piece did not lie in the tolerance range, this work piece would then be discarded by means of the robot from laser micrometer to station G. This station G is called as trash box. Discarding the work piece here simply means that this work piece is of no use or it does not certify the standard quality. Below is the table which explains the third scenario.

Table 3: Scenario of Testing

Position of piece	**Process**	**Machine**
A→B	displacement	robot
B→E	move	conveyor
E→J	displacement	robot
J	testing	Laser micrometer
	return displacement	robot
E→B	move	conveyor
B→A	displacement	robot

4.3 Unify Modeling Language (UML)

The UML is usually usable for illustrate "software plants designed for wide range of application" (Guerra-Zubiaga & Young, 2008). "Visualizing, documenting O-O systems and specifying construction are the aim of the UML software". Modeling information and knowledge for the manufacturing facility can use as source for make decision. UML is as tool for considering case study from three phases namely:

a) Requirement phase

b) Design and developed phase

c) Implementation phase

4.4 Requirement phase

4.4.1 Use case Diagram

The requirement phase started by use of a case diagram. This diagram explains the system at high level. In fact this diagram usually doesn't mention details it just shows the general aspect of a system. As you see in Fig 2 there are six phases where every phase consists of many small phases. The phases of any one system usually have a

direct contact to a person who monitors or controls. In this case there are three different people that have contact with system. The first operator has a direct contact with all the phase that is controlling or monitoring of a system. Second person or operator is a supervisor. Usually for considerations and for making contact between internal or external phases a production system needs to have a supervisor. So here a supervisor is in contact with all of these phases. The third person in this system is maintenance guy who has contact with all the phases, but in maintenance phase he should do routine checkups for example he needs to keep check on machines whether the machine need to have an oil change or other maintenances according to the defined time table. So here he has constant and variable contact according to the situation or request.

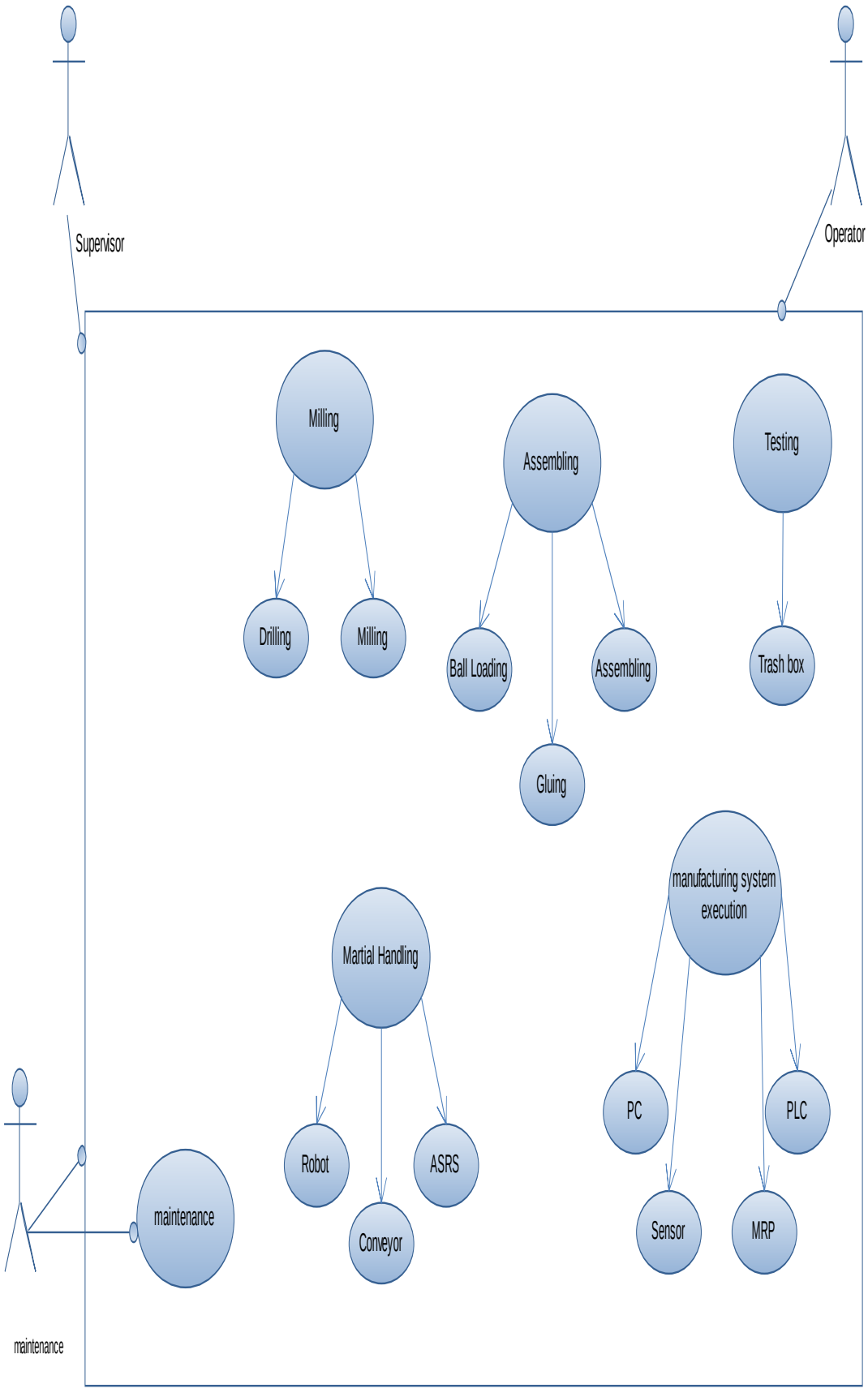


Figure 2: Use Case Diagram

4.4.2 Sequence Diagram Shop

Sequence diagram is a type of communication diagram that shows how processes work together and what is the demand. It is a creative plan which in fact is a message on how to work on the system and tells us the sequence to follow. A sequence diagram describes the level of communications in the system. It represents the objects and classes related that are related to each scenario and the sequence of messages that are to be performed on each scenario depending on their need or if specified.

Like any other case, sequence diagram here is related to our case where we realize the logistic view of our system. Sequence diagrams also have other names such as timing diagram, event diagrams and event scenarios. As we see in Fig 3 there is a sequence diagram for CIM shop of EMU. In this diagram there are many different objects like the machine tools that are used during the process of shop, the storing and assembling of work piece. In the sequence diagram we have many different columns. Each column represents a process and the time duration during this process is shown by the length of the rectangular block. So according to this rectangular block we know the no of processes involved which are around fourteen processes. These processes are movement, displacement, milling, testing, assembling and storing. These processes can be seen in under the columns of the sequence diagram in fig 3.

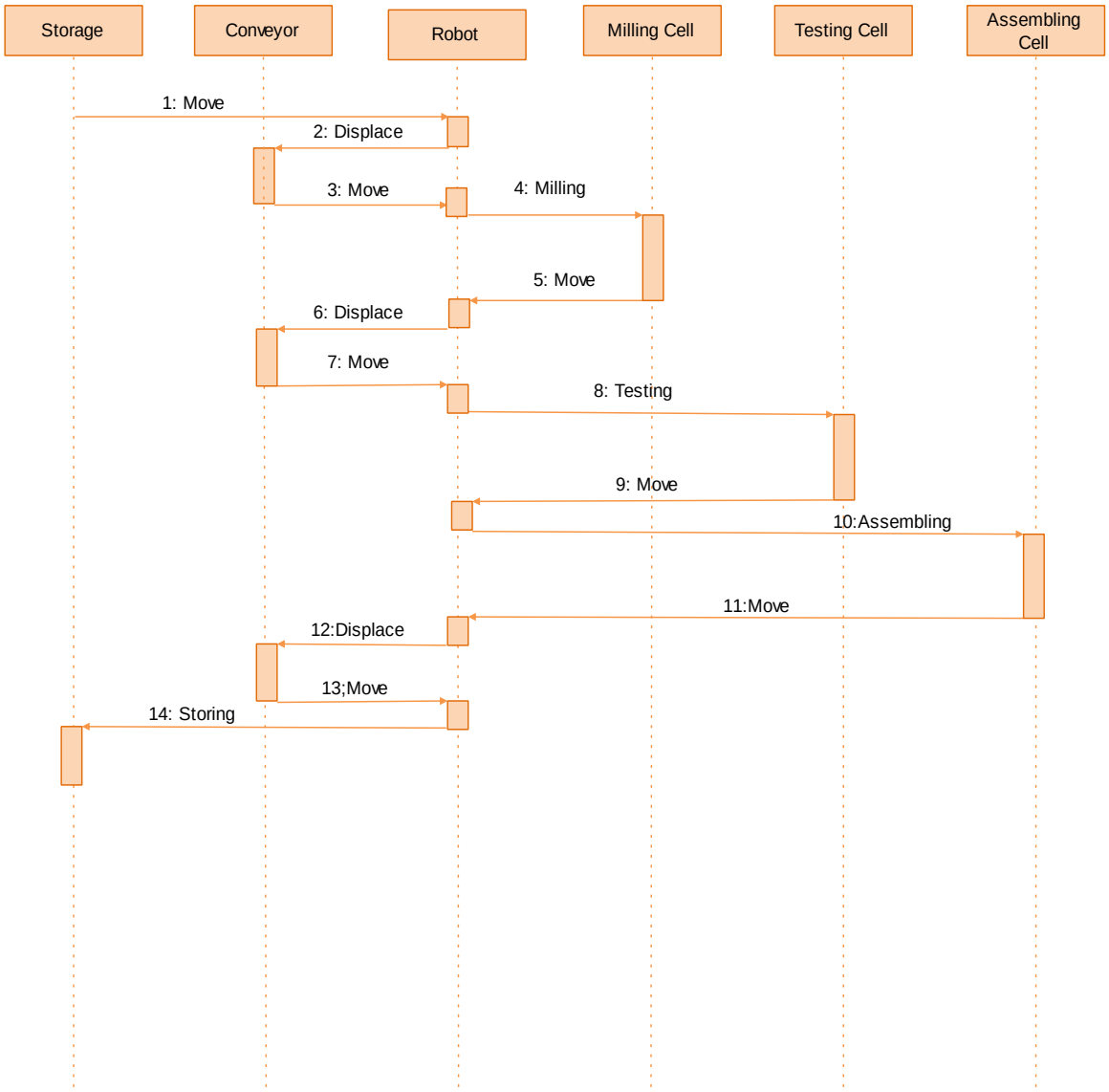


Figure 3: Sequence Diagram Shop

4.4.2.1 Sequence Diagram Assembling Cell

Fig 4 is about sequence diagram assembling cell. In fact it is part of the Fig 3 as you see assembling is one of the cells in shop. In this cell there are six objects which do many processes, these objects starts the process from the storage until it is kept back to the storage as the End product. During this time it has gone through all

the other processes including the loading of ball, gluing and assembling. Here we have three types of time, these are the movement time, displacement time, and machining time which can be seen by the rectangular blocks in fig 4 below.

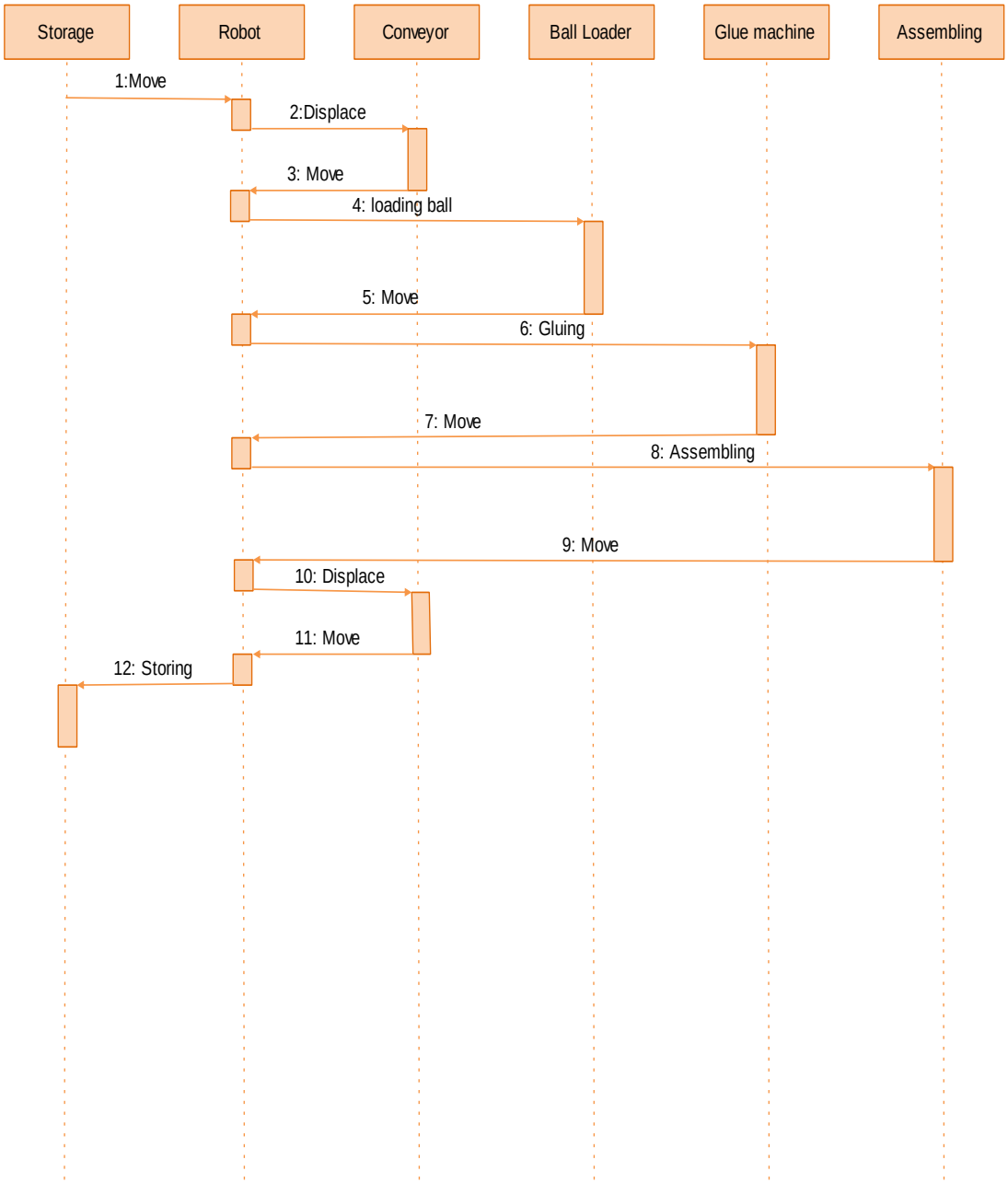


Figure 4: Sequence Diagram Cell

4.4.3 Activate Diagram Shop

The activate diagram is a graphical presentation of work currents in a system, which have back up for selection, repetition and concurrency. In the UML, activity diagrams can be used to define the business and operational steps in a system. In fact activity diagram illustrates the whole stream of control. An activity diagram consists of many shapes, connected with arrows. The most important shapes that we use here are: oval, diamond, bar, filled circle and encircle filled circle. The oval represents the activities, while the diamond represents the decision, the bars represents the start or end of simultaneous activities, the filled circle states the start of activity while the encircle filled circle is the end of the activity. All this can be seen in fig 5 where all the steps and activities are clearly presented. According to this diagram, in the first level we receive work piece into system after then the robot takes the piece from storage to conveyor and then when the work piece arrives to first station the robot takes it to milling process. When the process is finished robot have two option putting the work piece on conveyor and bring back to storage so as to finish the process or take it to second process namely testing and after testing by laser micrometer machine by operation of robot work piece taking it for assembling.

There are three processes in assembling, which start by the operation of robot injecting the ball then gluing where the balls were placed and then assembling it with the second work piece. This concludes the assembly part. Later than again by operation of robot and conveyor the work piece is sent back to the storage.

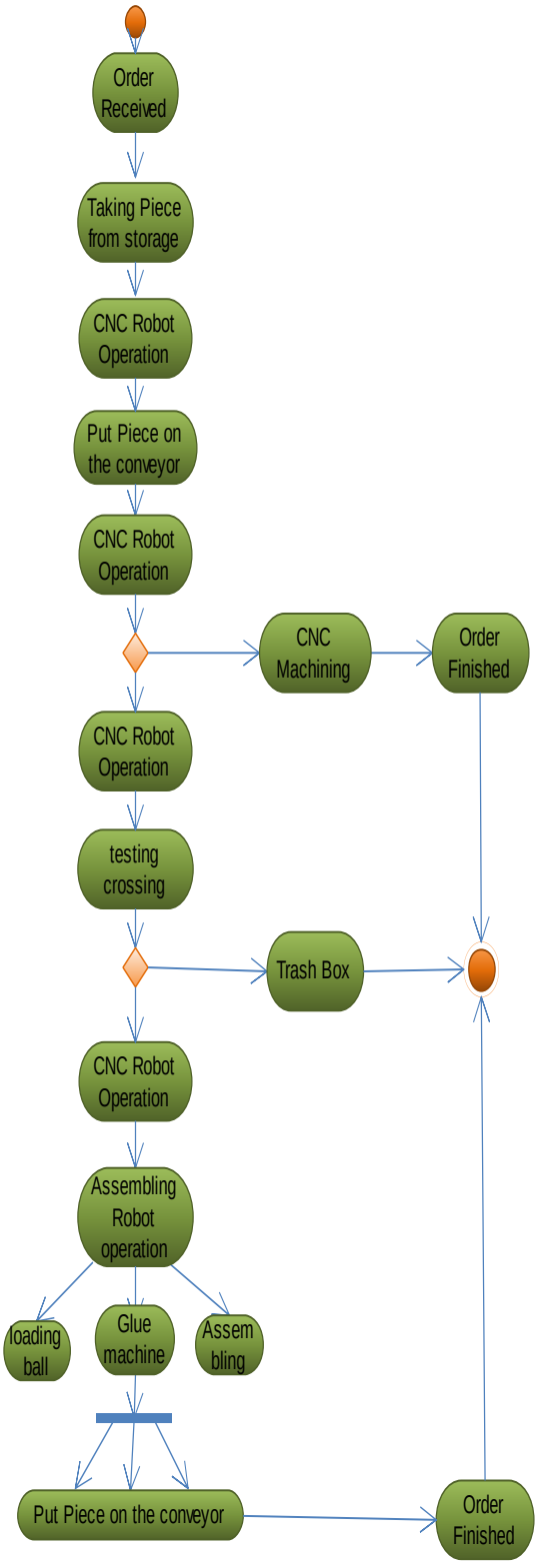


Figure 5: Activate Diagram Shop

4.4.3.1 Activate Diagram Assembling Cell

In Fig 6 you can see activate diagram assembling cell. In this process there are two work pieces after receiving order the operation of robot begins with transporting the first piece on conveyor. Exactly in front of the assembling cell robot take the first work piece from conveyor to ball loader for loading four balls, when finished robot takes it in to the assembling area. Then by operation of robot second work piece is taken to assembling machine and keeps it next to work piece 1. Next step is to take the gluing machine by robot and put the glue on the first work piece and the put the gluing machine back to its original position. The robot will then now assemble the second work piece on top of the work piece 1 and hence the work pieces are assembled together by means of robot. And after the process is finished and End product is sent back to pallet on conveyor so to come back to storage and order is finished.

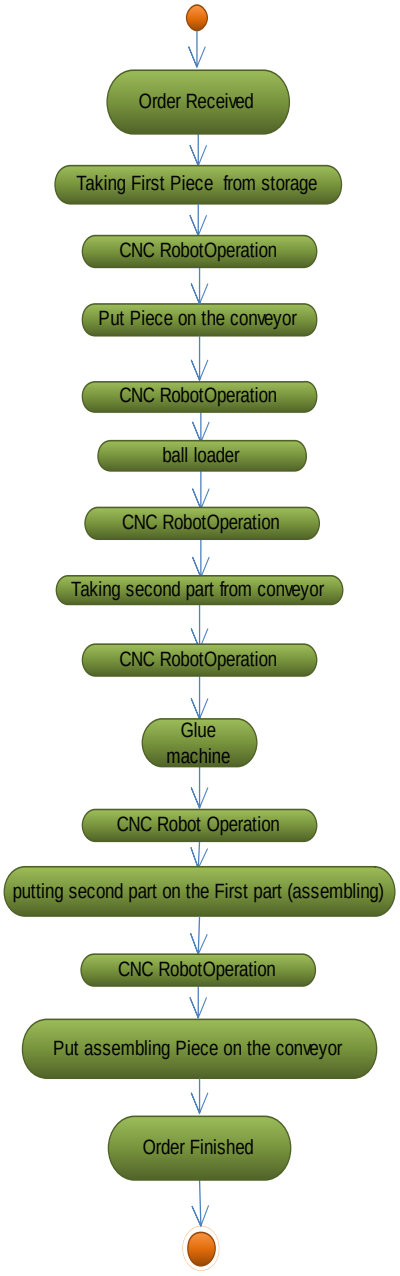


Figure 6: Activate Diagram Cell

4.5 Design and Development Phase

4.5.1 Data, Information, Knowledge

It is necessary to make concept of knowledge and information linked to the manufacturing facility that we have studied about. Resources and processes are within the manufacturing facility where its components are presented by its category

and model of a structure. Understanding of the differences between knowledge and information is linked to resources and processes which are necessary to specify knowledge, information and data. Data is linked just to numbers or words which mean that the context is related to the use. And this data makes up Information in order to present a meaning for our context .Knowledge has many explanations. When we can use knowledge to be able to identify valuable data and create relationships within our contexts, we are able to conclude these relationships from raw if the information is structured. There are three main types of knowledge: explicit, tacit and implicit:

Explicit knowledge: it is logical and objective, such as: graphs, texts, product specifications, tables, diagrams, formulas, etc.

Tacit knowledge: are subjective, such as: pattern, storytelling, video-clips and sketches

Implicit knowledge: it is concluded from performance of another person.

4.5.2 Class Diagram

As you can see Fig7 shows UML top level class diagram. According to this work we can identifies three types of classification in the manufacturing knowledge modeling to make easy access to the manufacturing knowledge and information. “These classifications includes: (a) facility knowledge, (b) processes knowledge and resources knowledge” (Guerra-Zubiaga & Young, 2008). In fact all the manufacturing knowledge is prepared in a facility knowledge class which is divided in to resource knowledge and process knowledge.

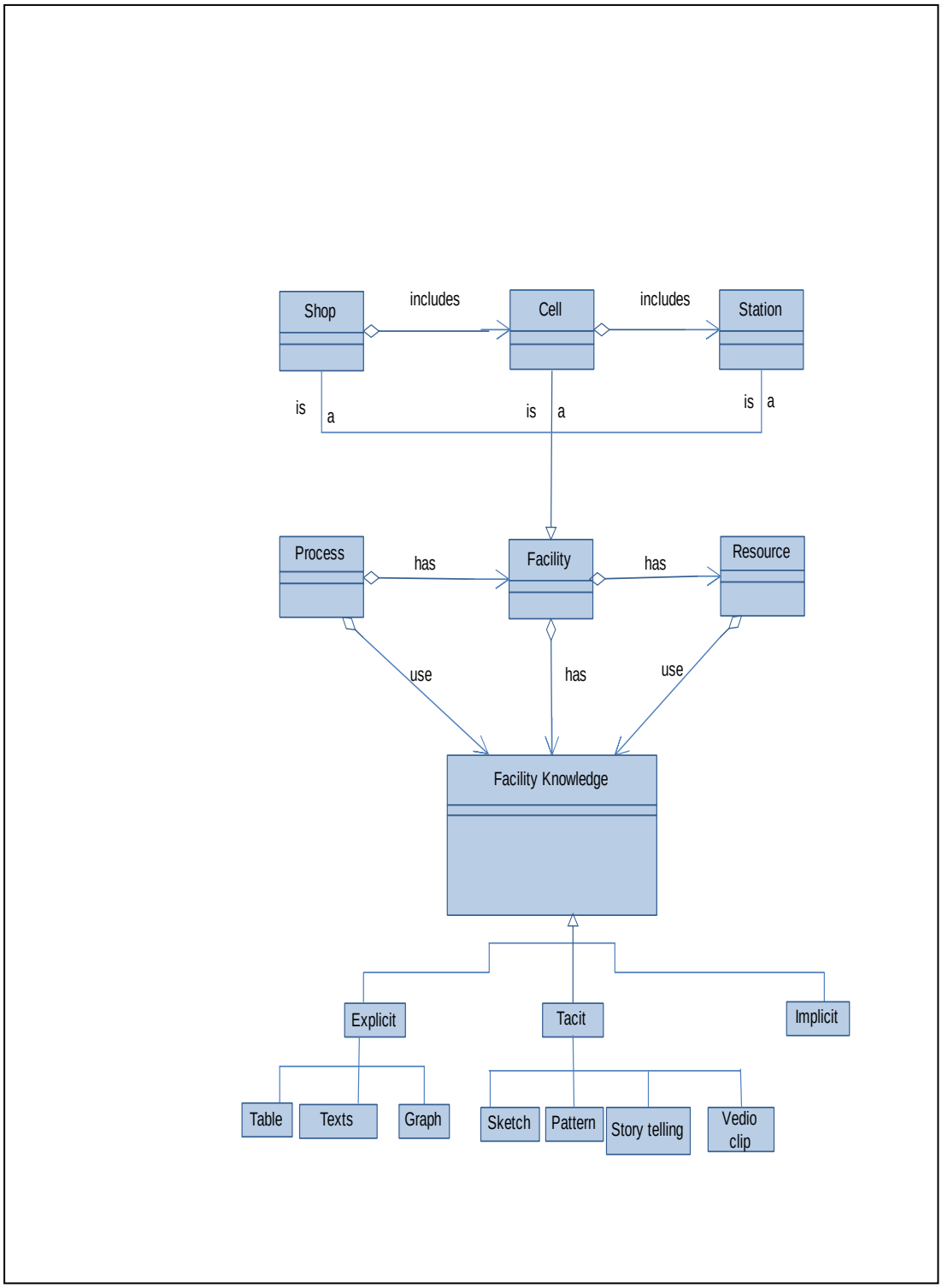


Figure 7: UML Top Level Class Diagram

4.5.2.1 Class Diagram Shop Level

In Fig 8 we can see UML class diagram of shop level case study, which divided to two facility knowledge namely ,knowledge process and knowledge resource.

Knowledge process consists of four processes: milling, assembling, testing and material handling this includes storing and conveying. On other hand, in knowledge resource there are ten resources namely: pallet, PC, PLC, storage, CNC milling, assembling machine, laser micrometer machine, conveyor, controller and robots. There are two types of robots in the system (Escorobot ER9 and Escora ER1).

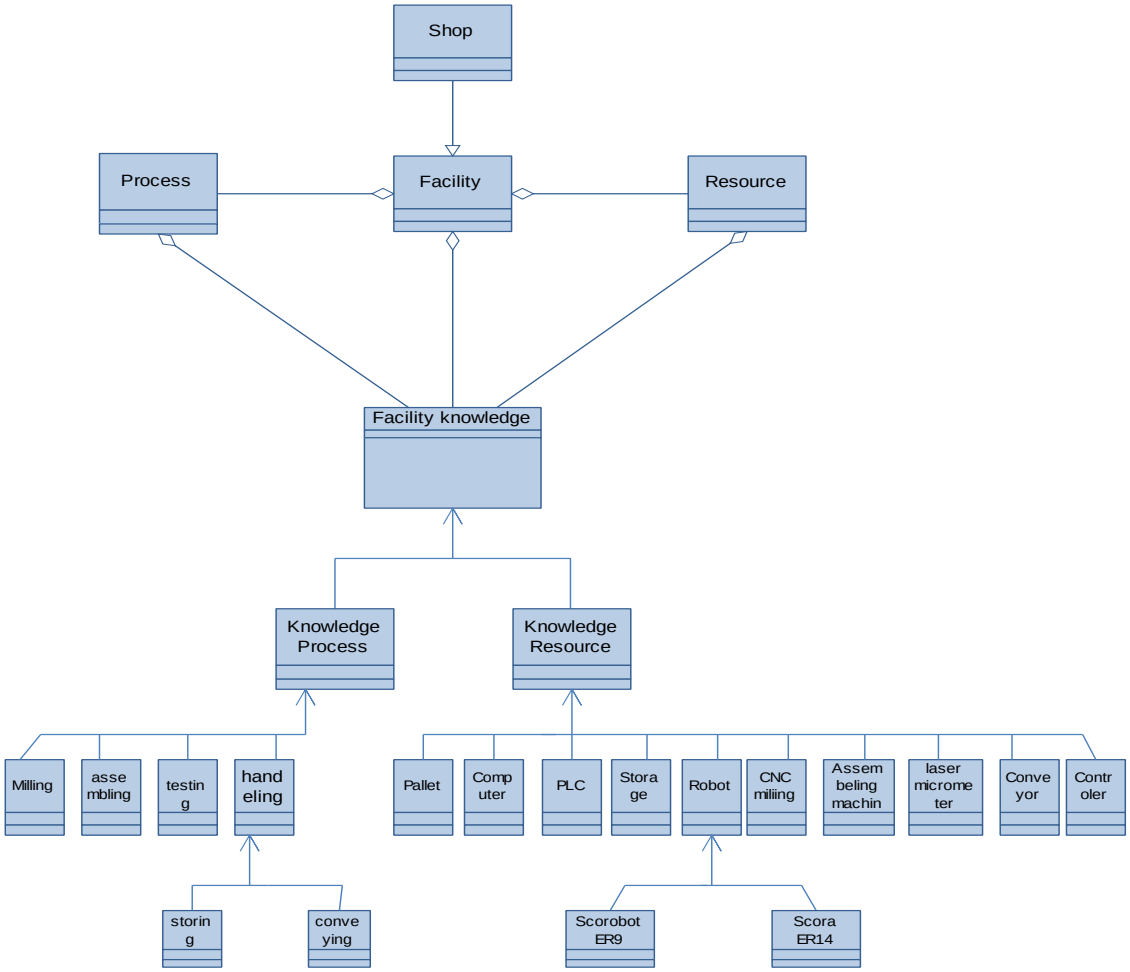


Figure 8: Class Diagram Shop

4.5.2.2 Class Diargam Cell Level

Fig 9 is UML class diagram in cell level which introduces the knowledge level of processes and resources in assembling cell. As you see there are four processes and nine resources in this knowledge level.

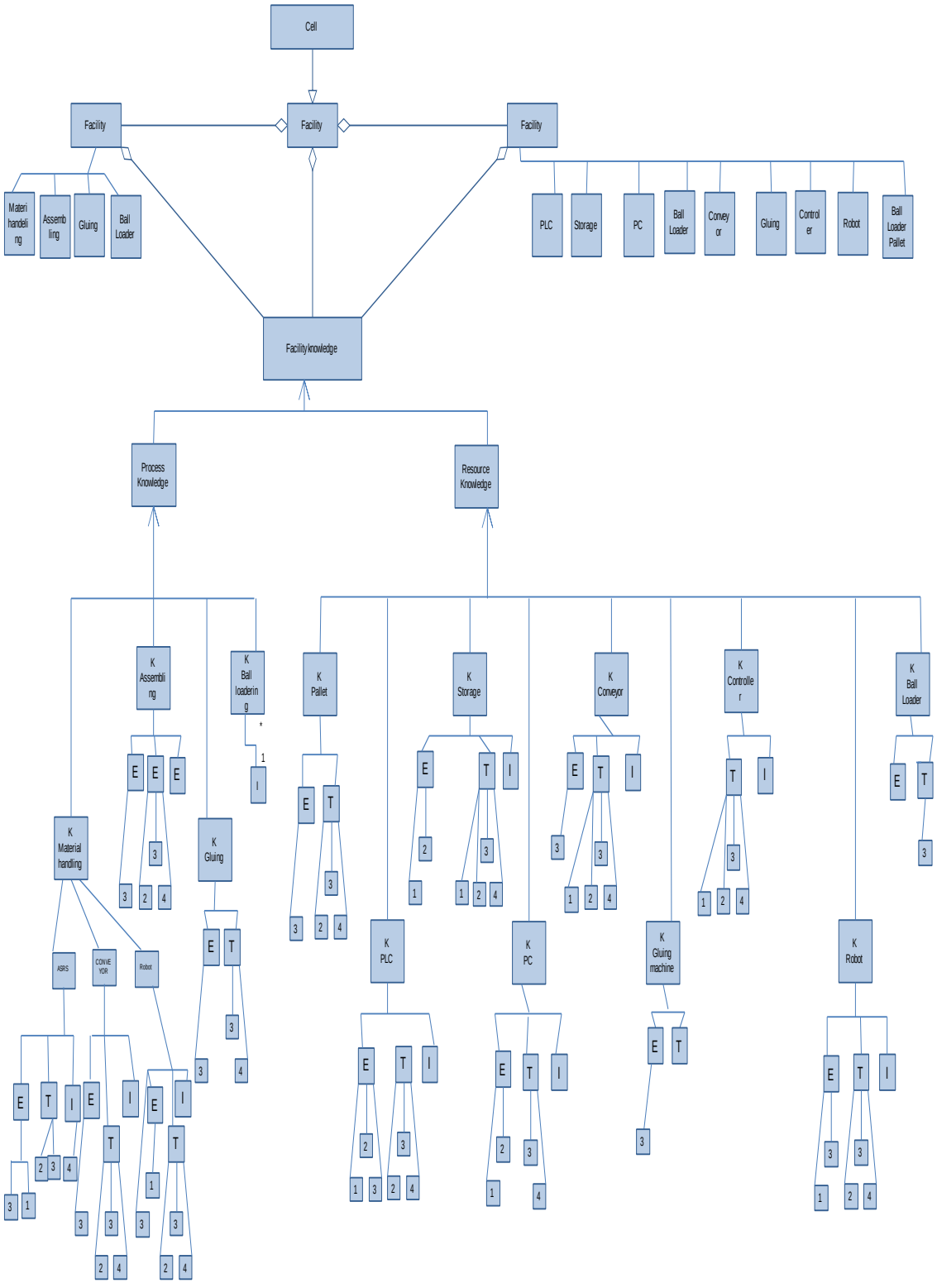


Figure 9: Class Diagram Cell

4.5.3 Object Diagram

Fig 10 illustrates the object diagram of an assembling cell. In this Figure we can see all physical aspects of assembling machine, which in this system contains pallet, PLC, storage, PC, conveyor, gluing machine, robot, controller and ball loader as a resource.

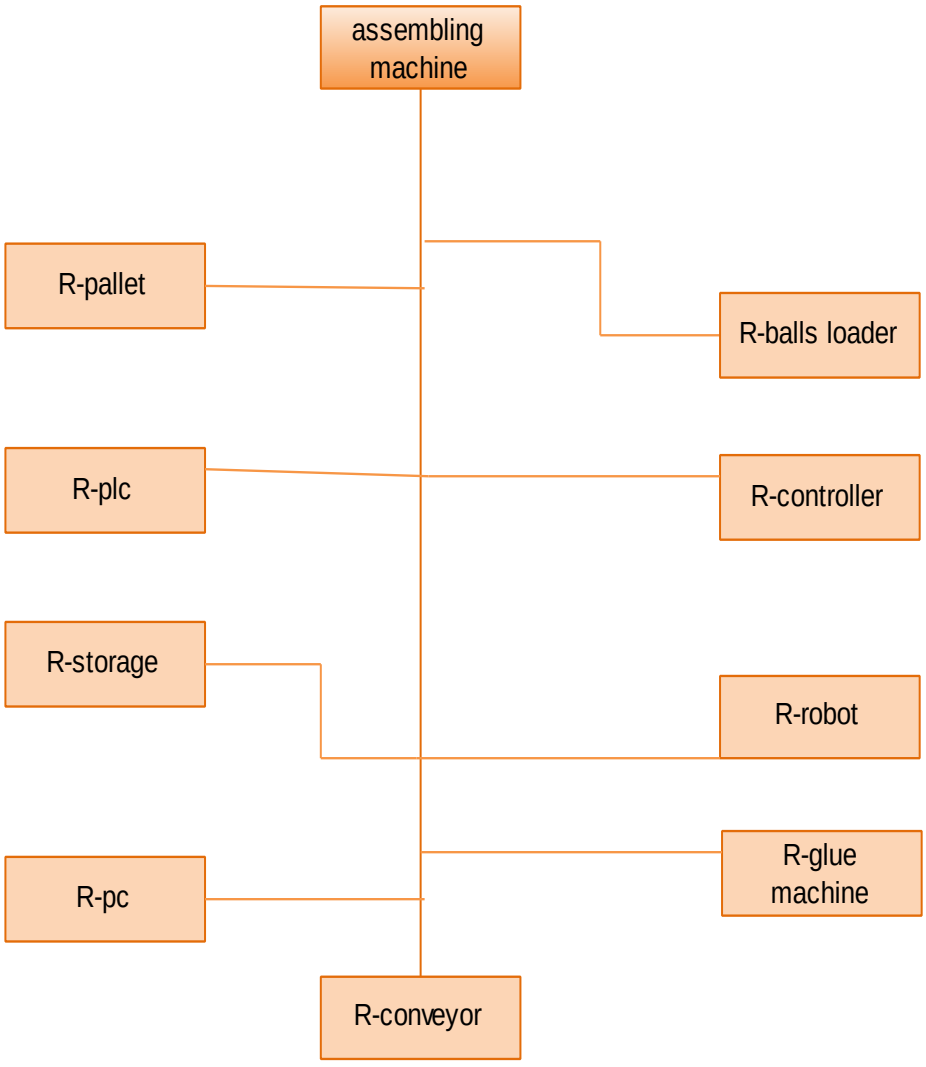


Figure 9: Object Diagram Cell

4.6 Implementation Phase

4.6.1 Competency Model

According to javidan 1998 competency has been defined as “a cross-functional integration and co-ordination of capabilities”. Cross-functional integration is the establishment of mechanisms and links that facilitate the needed coordination of the activates of different function to ensure that these function work together effectively to achieve the overall objectives of the organization such integration is also needed across different organizations to create as well managed, integrated supply chain of cooperative organizations with high responsiveness and low transaction costs.

The capability analysis tool (CAT) architecture and its details are developed to open the scenario of processes. This CAT process predicts the capabilities required for making decision in take and produce order. As you can see Fig 11 illustrates the competency analysis tool this makes it a suitable choice for capabilities. In two previous phases namely requirement and design phase we tried to introduce system and classification of resources, processes and knowledge capabilities in system by UML diagrams. In implementation phase we will show how using of information and knowledge to specify capabilities and finally competency modeling to make best decision.

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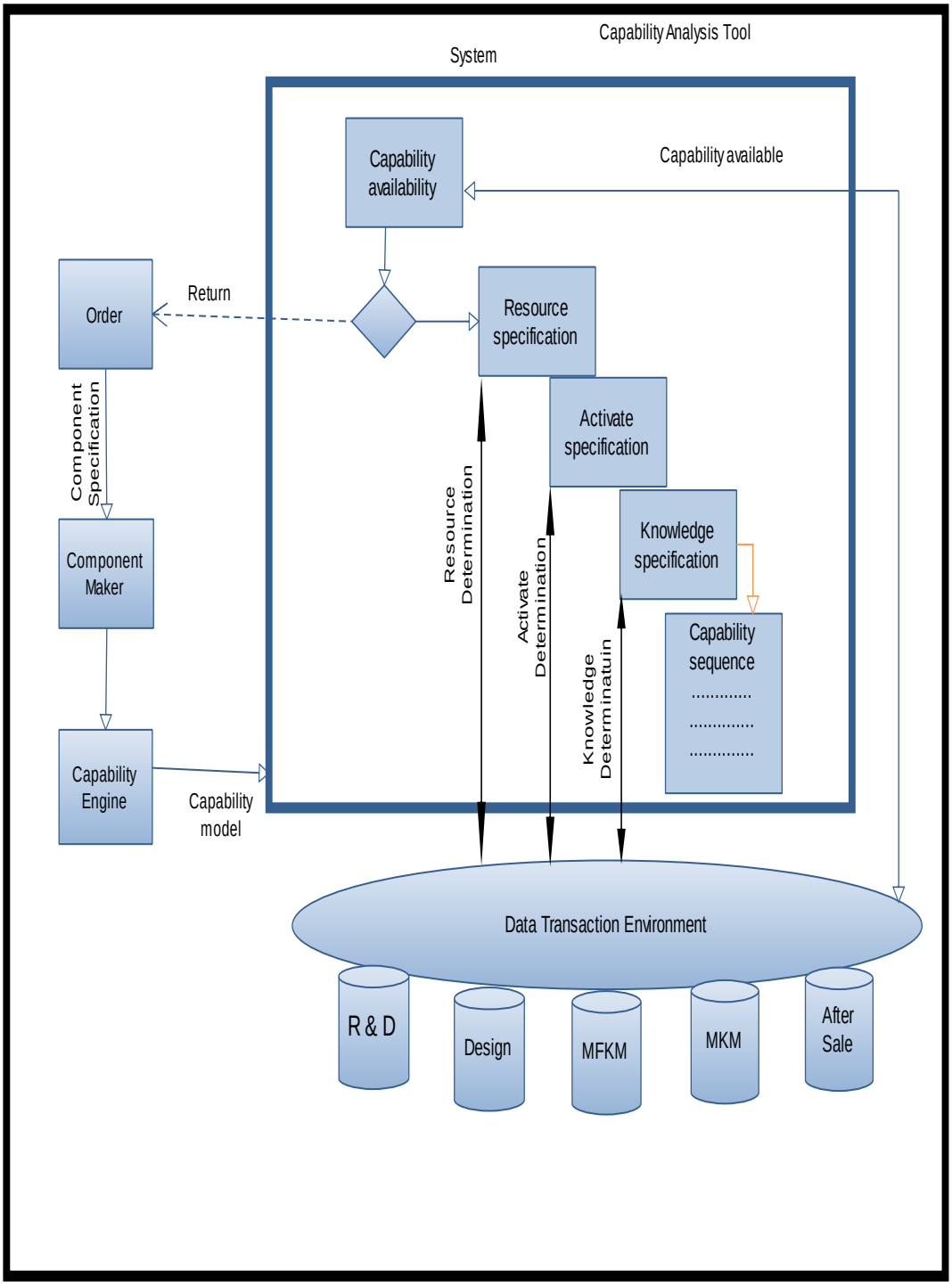

Figure 10: Competency Model

Fig 12 illustrates the transaction current of capability analysis tool in process. The detailed analysis is described in five levels; these levels are marked on the figure.

STEP 1: component maker is able to get orders/information for making specified parts and illustrate these specifications as Comprehensive plan for capability engine (①).

STEP 2: The specification of parts are loaded in a Capability Engine to predict capability model to be able for building order (②).

STEP 3: when system wants to know the availability capabilities of order, the Capability Analysis Tool is triggered and predict capability is send to capability analysis tool(③).from predicted capability model , the analyzer considers the availability of capabilities in system. If the result of analysis is not available, its model returns to component maker (④) and then to client.

STEP4: after making sure of the availability of capabilities, they are sent to next level in analysis tool for finding the resources, activities and knowledge capabilities that are required for making a product (⑤).

STEP5: with the capability analysis tool (CAT) results, making a decision for taking the orders and hence making the decision for production line would be easier.

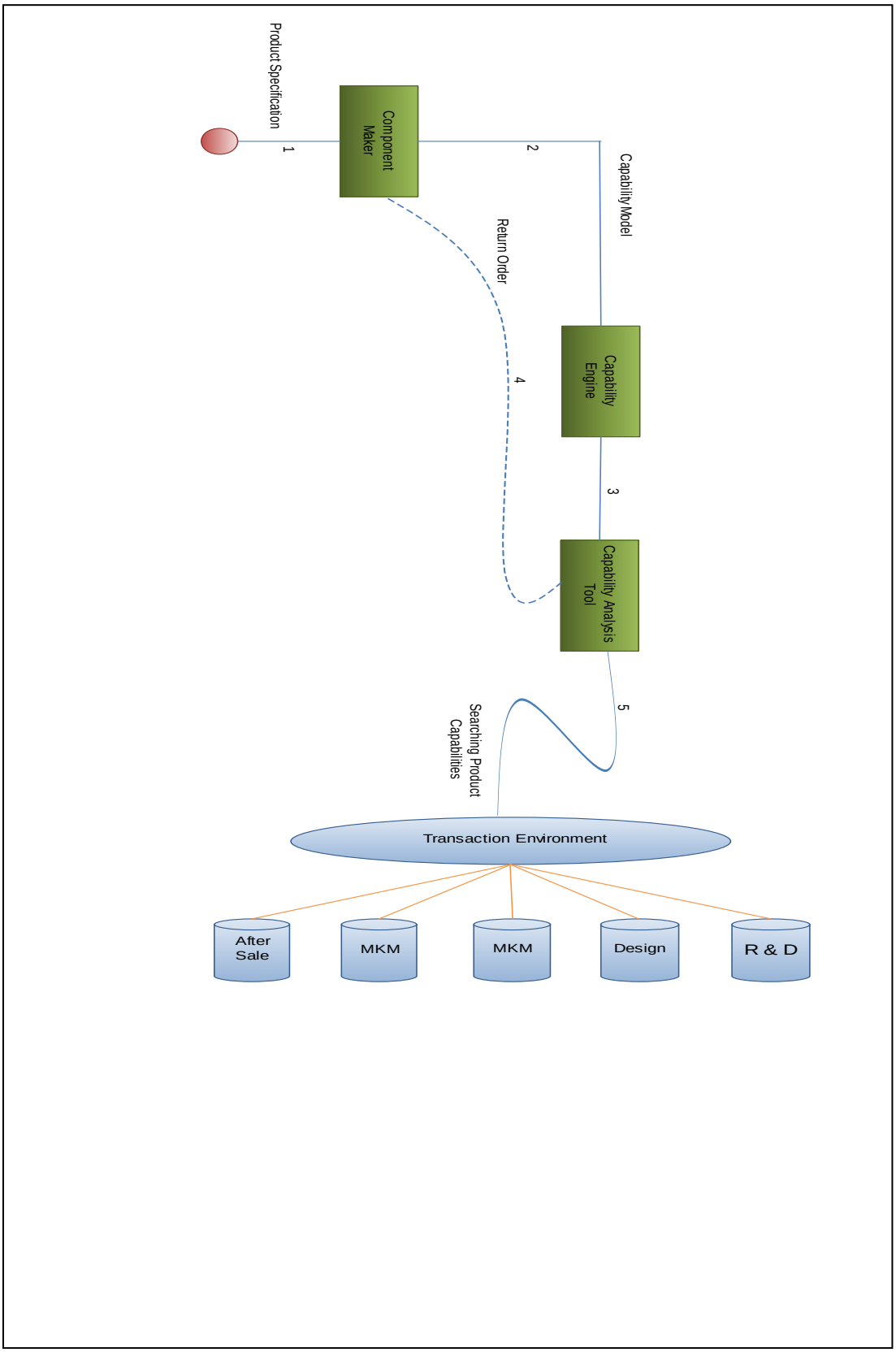

Figure 11: Transaction Current of (CAT)

Chapter 5

CONCLUSION

As the world is moving in to technologies, more and more research and study is being performed. Engineers are always studying and working to find a solution for problems. This results in development of newer technology. The newer technology into market leads towards competition, making market an unpredictable place for the firms to be stable. And because of this situation we need to have a system. This system is called flexible system. But to have a flexible system we should have an easy and fast access to the resources, capabilities and competences in different situations.

This thesis has been a competency-based information and knowledge model for intra-enterprise. A capability-based information and knowledge model for Computer Integrated Manufacturing (CIM) laboratory of Eastern Mediterranean University (EMU CIM lab) constructed. Now to conclude, the research methodology of this thesis is divided into three phases, namely; requirement phase, design and development phase and implementation phase. Unified Modeling Language (UML) employed as modeling languages. The requirement phase consists of three types of diagrams namely: use case diagram which introducing the system in high level of communication, sequence diagram which show how the processes is working and activity-diagram which illustrates the whole stream of the system. The design and development phase deals with identification and classification of information related to resources and processes and corresponding knowledge. Appropriate class

diagrams and object diagrams are required in this phase. For implementation phase, based on out comings of the previous phases a Capability Analysis Tool is designed.

By use of this tool enterprise doesn't need to spend longer time in critical situation to make decision. It would help to in short time, after predicting the product capabilities as input in the system to make upon decisions on how to produce and choose economical production method. The output of this work is improving decision making and finally interring to global markets with ability change capability for competition.

Future Work

The aim of this thesis was to provide competency-based information and knowledge model for intra-enterprise .In fact we designed architecture for a capability analyses tool in implementation phase but for future this architecture is developable for use in inter –enterprise by supporting from network. For example if many enterprises have collaboration they can improve their capabilities by use of this architecture for make competency modeling. This work help to enterprise to doesn't return the order to customer because of insufficient capability.

REFERENCE

Barney, J. (1991). Firm resource and Sustained Competitive Advantage. *Journal of Management*, 99-120.

Collis, D. (1994). Research note:How Valuable are Organizational Capabilities? *Strategic Management*, 143-53.

Dierickx, I., & Cool, K. K. (1989). Mnagement Science. *Journal*, 1504-1513.

Eisenhardt, K., & Jefyey, M. (2000). Dynamic Capabilities: What Are They? *Strategic Management*, 1105-21.

Fiiol, m. (2001). Revisiting and identify - based view of sustainable competative advantage . *Journal of Management*, 691-699.

Grant, R. (1991). The Resource- based Theory of Competitive Advantage: Implications for Strategic Formulation. Journal of Management , 114-36.

Hafis, T., & Thomas, H. (2005). The field of strategy: in search of a walking stick. *European Management Journal*, 507-19.

Hamel, G., & Prahalad, C. (1990). The core competence of the corporation. *Harvard Business Review*, 79-92.

Helfat, C., & Peteraf, M. (2003). The Dynamic Resorce-Based View:Capability Life cycles. *Strategic Management*, 997-1010.

Javidan, M. (1998, february). Core Competence: What does it mean in Practice. pp. 60-71.

Montgomery, C., & Wernerfelt, B. (1988). Diversification, Ricardian Rents, and Tobin's q. *Rand Journal of Economics*, 623-632.

Nonaka, I., & Konno, N. (1998). *The concept of "Ba" Building a Foundation for Knowledge Creation.* California: California management .

Penrose, E. (1959). *The Theory of the Growth of the Firm.* Oxford: Oxford University.

Peteraf, M., & Bergen, M. (2003). Scanning Dynamic Competitive Land Scapes: A Market - Based and Resource Based Framwork. *Strategic Management*, 1027-41.

Porter, M. (1985). Technology and Competitive Advantage. *Business Strategy*, 60-78.

Ray, G., Barney, J., & Muhanna, W. (2004). Cpabilities,Business processes and Competitive Advantage. *Strategic Management*, 518-32.

Sanchez, R. (2004). Understanding Competence-Based Management: Identifing and Managing five Model of Competence. *Business Research*, 518-32.

Sanchez, R., Hubertus M, T., & Heene, A. (1996). Towards the Theory and Practice of competence - based Competition. *New Strategic Management*, 1-35.

Schumpeter, J. (1934). *The Theory of Economic Development.* Cambridge: Harvard University Press.

Spanos, Y., & Prastacos, G. (2004). Understanding Organizational Capabilites: Toward aConceptual Framwork. *Knowledge Management*, 31-43.

Teece, D. (1982). Toward an Economic Theory of the Multiproduct Firm. *Economic Behavior and Organization*, 39-63.

Teece, D., Pisano, G., & Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management*, 509-33.

Teece, D., Pisano, G., & Shuen, A. (2004). Understanding Organizational Capabilities. *Knowledge Management* , 31-43.

Urban, L. (2007). Core Competence Beyond Identification :Presentation of model. *Management Decision*, 393-402.

Wang, Y., Hing, p., & Yang, Y. (2004). The constituents of core competencies and firm performance. *Engineering and Technology Management*, 249-80.

Wernerfelt, B. (1984). A Source - Based View of the Firm. *Strategic Management gournal*, 171-80.

WernerFelt, B. (1984). Resource-Based Theory of the Firm. *Strategic Management*, 171-180.

Winter, S. (1995). Knowledge the Speed of the Transfer and Imitation of Organizational Capabilities. *Strategic Management*, 193-211.

Winter, S., & Nelson, R. (1982). *An Evolutionary Theory of Economic Change.* Cambridge: Belknap Press.