8. Using Gamification In Design of Application

by Ririn Dwi Agustin -

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Our gratitude to all the participants who has take a part in this conference, I hope we can take the advantage of academic research findings, to have better insight about the importance of IT and business application, to the country's economic development

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Prof. Ir. H. Bochari Rahman, M.Sc

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USING GAMIFICATION in DESIGN OF APPLICATION S/W FOR FINAL PROJECT COURSE MANAGEMENT CASE STUDY AT INFORMATIC ENGINEERING PASUNDAN UNVERSITY

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Keywords: *Gamification, SAPS, Final Project Course, Game Design*

Abstract. *This paper describe idea of game design element in application software final project management system at informatics engineering Pasundan University. The idea base on SAPS model (Status, Accesss, Power, and Stuff). This gaming is goal oriented, which is the goal is indicated by the Red Badge. It means that student have passed of all step of final project core activity.*

The gaming idea intend for improve cognitive engagement and behaviour engagement. Cognitife engagement will increase knowledge level about final project process that have contribution for improve internal motivation. Eventually they improve behaviour engagement for final project process completion.

For cognitive engagement, gaming is implemented through learn activity for gain knowledge level status. This status will unlock work as tutor activity to collect point. The point is needed for unlock stuff ("golden ticket") for get special service about core activity or player power. Knowledge level is needed for unlock core activity, which is steps to achieve the goal.

Improvement behaviour engagement be pursued through using appointment game mechanic for maintain supervising attendance and ownership for attract students desire to add regularly the component of final project report book. Supervisor approval is needed for judge the progress of final project report book and for the attendance. Level of attendance and level of progress is required to unlock some core activity.

Rule of game be declared in "Access" as and-or graph. Node represent the activity and edge represent status – value. Each activity have impact to value of the status as decrement or increment process.

1 INTRODUCTION

Final project or thesis is a subject that has specificic requirement, those are 1) Individual learning (opposite of classical learning) 2) endless like research activity, needs deeply to define the scope of the problem, purpose, and finalizes it at allocated level or time. 3) Role of administration process which consists of registration process, conducting research, preparing reports, and evaluations procedure.

One consequence of the nature of the individual learning is to only understand that she/he is ready to apply regulations of final project and take thier responsiblity, honesty, confidence, hardworking as students by having good interpersonal skills for communication with supervisors

Helping from final project's manager will be done if there is complain from student or supervisor or after evaluation process. Meanwhile evaluations conducted classical and is usually done in a relatively loose milestones, ie once a semester. So, the manager cannot know what the student's problem quickly. Here, it was complete solitude for the student.

Systemic Impact of those was the average final project's completion time of 2 - 3 semesters (but usually target is 1 semester only). The individual impact related is is most of them The individual impact related with substantive material is most of them overwelmed by stress, fear, anxiety, loneliness, stuck in a situation, and then frustration, by loosing their motivation. The other case, because seldom go to campuss, they often not applying about administrative procedures and schedules. The last ones problem sometimes have significant impact on their study.

In this paper will be described design concept of application software for support final project management system with gamification approach. This approach be intended for overcome those problems. First, encouraging students face problem in the completion of their final project with highly motivation. Second, forced them met with their supervisor regularly. Hopefully from the interaction they will get guidance and enlightenment for overcoming their problems. Third, final project's (FP) manager can monitor progress of students final project easily. The outcome is evaluation and action plan to solve problem or improve the process can be taken quickly. Fourth, making all of the activity can be done by fun. Ilustration of this s/w requirement based on system requirement is described at figure 1.

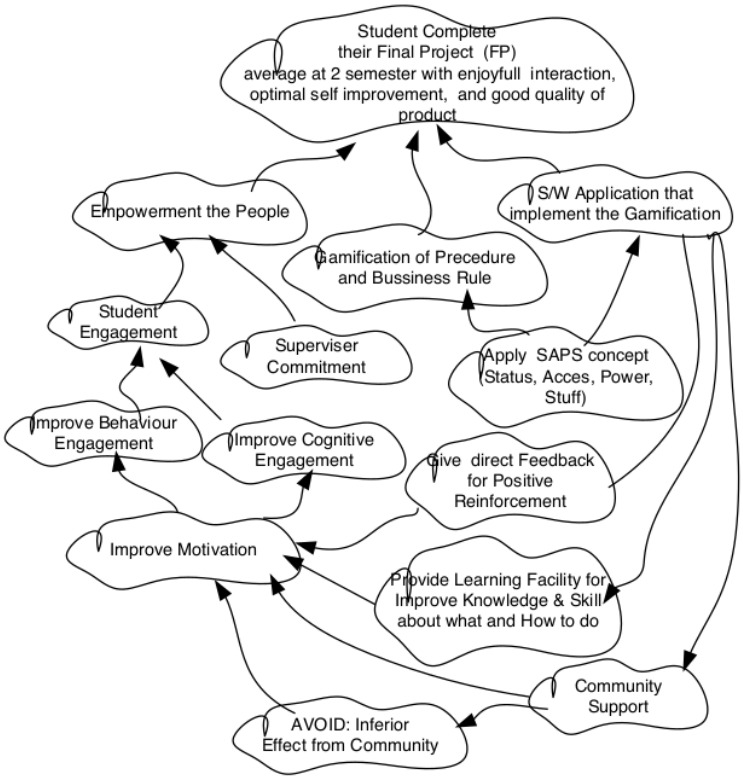

Figure 1 System Requirement for "More Fun Final Project Process" [5]

Gamification is the use of game design elements in non-gaming contexts that promise to improve user engagement and acquisition of knowledge by user through simulated model of the real world. In this paper will be elaborated the idea of game concept in application software for final project's management system. Implementation of gamification starts from the analysis of business processes final project, literature review about game design element, especially about game mechanic, description of the basic idea of the game in the final project management system using the SAPS (status, acces, power, stuff) model , detailed descriptions of the game design elements, ends with describing of system use case.

2 LITERATURE REVIEW

Gamification is mean using game design element in non-game context [1]. Element of game design is represented in five abstraction levels. There are game Interface design patterns, game design patterns or game mechanics, design principles and heuristics or 'lenses' , conceptual models of game design units, game design methods and design processes. Leaderboard, badge, progress are game design elemen in game interface level . Achievement , appointment,

cascading Information theory are are game design elemen in game design pattern level. SAPS is one of game design pattern level.

SAPS (Status, Access, Power, Stuff) is a concept to make fun, engaging, and motivating game. SAPS is proposed by Gabe Zicherman [3]. Status represent player position relative to the standard or to the other player. Status is used to recognize user effort or performance, so it must sticky and least expensive. Access is the rule that defines the rights of players to perform various activities and use a variety of services in the game. Power granted to players who have a certain status in order to facilitate the other players are involved in the same game. Stuff is something or free facilities granted to the player as a reward for achievement of their performance

The purpose of using Gamification is to improve user engagement and user experience [2]. Engagement is great deal connection between user with something like product or service or person or some idea [3]. In the context of website or mobile application s/w, there is an idea to quantity the engagement. The quantification is built by interrelationship of some metrics. The metrics are frequency, recency, duration, virality, and ratings. Frequency is about how many users make conection with the object (product, service, person, idea). Duration is about how long, users spend time in each their connection. Recency is about how much shorter the time gap between the last visit to the present. Virality is about how many the others users who are are influenced by a user to be engaged in the object.

3 BUSSINES PROCESS OF FINAL PROJECT COURSE MANAGEMENT

Primary activity in the final project course management system are supervising process and evaluation process. Evaluation process consists of three sequentially stage, there are proposal, seminar and siding(final evalutioan). The secondary activity include socialization final project procedure and research area, registration, supervising assignments, and monitoring and evaluation.

The outcome from the monitoring and evaluation process is used to determine whether or not to do a special program for the acceleration of final project for students belonging to a particular problem. In addition to, the final out come of the results must be re-checked again in order to evaluate the performance of the supervisors. By according each activity, the manager of final project will determine if the meeting will on or off by the time allocated, waiting the last annoncement from committee of final project. Illustration of the system can be seen use case diagram in Figure 2

Figure 2 Bussiness Use Case of Final Project Course Management at Informatics Engineering Pasundan University

Business process that have been described has a sequence that can be seen in Figure 3. The Sequence can be run on more than one semester, maximum in 10. Registration must be done at each early semester, as requirement to get all of the services in final project information system.

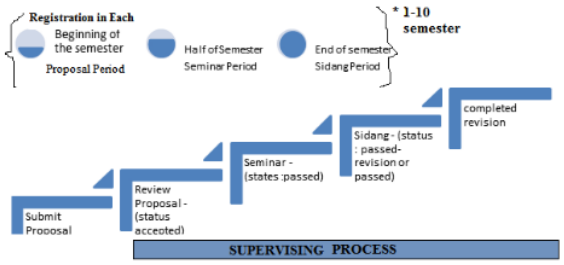

Figure 3 time sphere of final project business-process

4 THE GAME DESIGN CONCEPT

The heart of idea is inferenced from requirement at picture 1and SAPS model. These are about coginitif engagement, behaviour engagement , and funny.

1. Cognitive engagement, aimed to make students master about what it is and how to do FP. The impact is if the students understand well about the "what" and "how" then they will become clear goal. According to expert opinion, goal clarity is very influential on motivation. Here is necessary to the process of socialization FP gamification. The idea is to provide a feature applied learning center and then worked as a tutor on FP for dummy student or fellow participants. Requirements to be a tutor, must have a certificate from the learning center. Points are collected from the work is a prerequisite for administrative services. If the point exceeds a certain threshold, can be exchanged for gold ticket. Work became tutor intended to enhance students' understanding of FP detail. Here taken the concept that learning by teaching was very effective.
2. Behaviour engagement, intended to shape the behavior of students to be diligent and consistent in doing the supervision. From this it is expected that completion of the FP is guaranteed. In the designed system, the student must meet with a supervisor at least once a week. The quality of the mentoring process is reflected in the progress of FP books and other artifacts according to plan. Gamification is applied can be seen in table 1

Table 1 Game Mechanic [4]

Behaviour Engagement Aspect	Game Mechanic	Note	Status
Frequency of supervising	- Appointment	Supervising is in each week 1 semester: 14 times	Supervising (blue, green, yellow, red) If staus is Blue or Green Then get FreeLunch
Quality of supervising activity	- Ownership of FP's Artifac - Progress in each artifac - Achievement with spesical badges for each step (figure 3)	Artifac consist of 1.Refference 2.Proposal 3.Literature Review 4.Problem Analysis 5.Design of solution 6.Etc, can be defined by user as goal The progress is filled by Supervisor Badges is given by system	- Progress of Artifact that have been collected - Badges

Game design concepts that be used in this proposed application s/w is the "SAPS" (status, acces, power, and stuff). The ide of the gamification can be seen in figure 4. The goals in this game is **black badge**. The badge is mean student have completed revision of their final project's book dan they must get graduation certificate. The goal can be achieved through core activities but need execution of non core activities at first. Each core activity will have

prerequisites, that is a particular combination specific value of the "status". Each activity can have an impact i.e updates or adding elements of status.

The change value of status is required to unlock another activity . It can be seen that relation inter-activity form the prerequisite graph based on the spesific value of status. Rules regarding the connectivity shall be incorporated in the "access". "Power" and "Stuff" is gaming aspect to give rewards of the player (student) achivement. In the design of this game, "stuff" implemented by "gold ticket ". This Ticket can be used for getting special services . Player can exchange a certain number of the points have been collected with the "stuff". "Power" is applied by giving freedom to the player to give their golden ticket or a point to the other players / students.

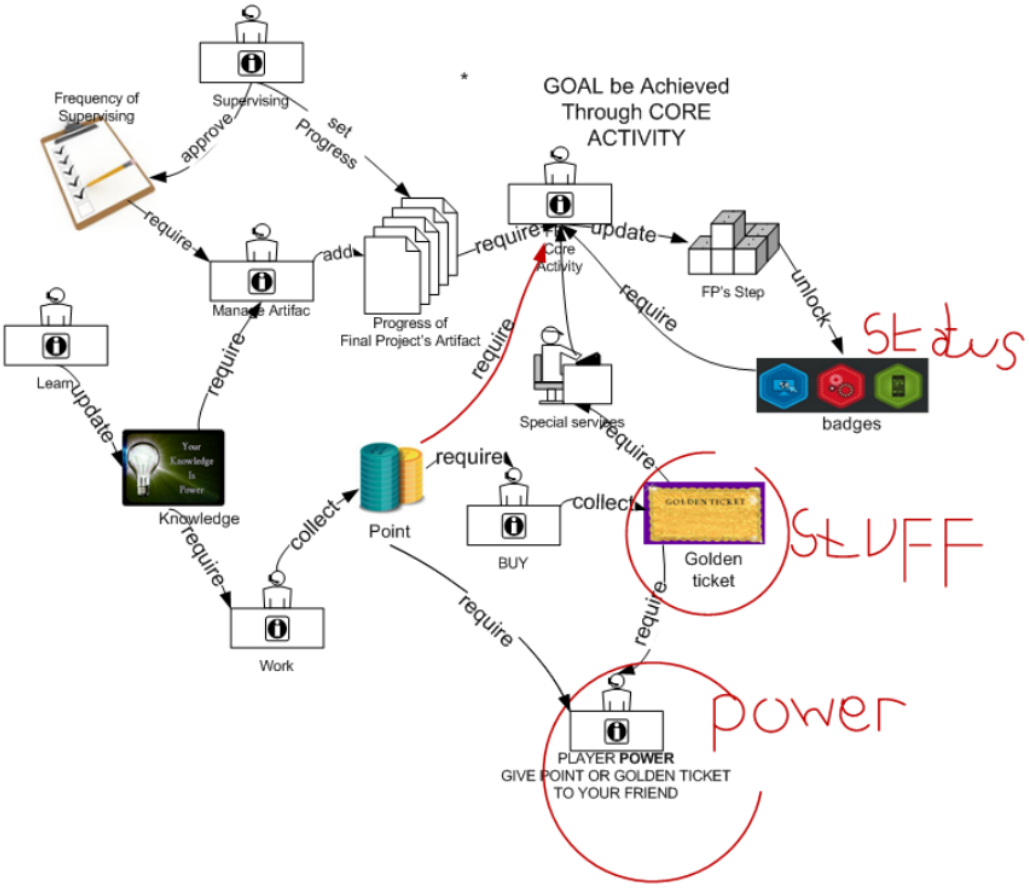

Figure 4 The Game Design Concept

4 DETAIL OF GAME DESIGN ELEMENT

4.1 Status

There were 7 kinds of status are used to represent the performance of a student in final project course, ie (1) registration, (2) knowledge levels of, (3) frequency of Supervising activity, (4) badge, (5) the final project formal step (6) poin, (7) progress of the artifact (final project book). Knowledge levels and point are used to encourage cognitive engagement. The rest are giving benefit to encourage behavior engagement. If the frequency of supervising activity is high and the levels of knowledge is high too then the progress of the artifacts FP should be high. Level of knowledge will result in increased opportunities to collect points from working as a tutor. While working as a tutor will also indirectly increase the knowledge. List of status detail described at tabel 2.

Table 2 list of status

No	Status Name	Domain	note
1	Registration	None, Expire,Active	
2	Knowledge Level	1,2,3,4,5	
3	Supervising Activity	0-100%)	(calculated by once a week , 14 times in a semester
4	Badge	white, yellow, orange, red	white= proposal is accepted . Yellow=seminar is passed, orange = sidang is passed, red= revision of final project completed
5	Core Activity Step		
5.a	Step-proposal	none,submitted,scheduled,revision, accepted	
5.b	Step-seminar	none,submitted,scheduled,revision, passed	
5.c	step-sidang	none,submitted,scheduled,revision, passed	
5.d	step-revision	none,completed,printed,signed	
6	POINT	1-10000	collected from work
7	Artifact Final Project		Total weight of 7.a until 7.g must be 100%
7.a	Bibliografy(Bibl)	weight=1%-100%, progress =1%..100%	Progress is set by supervisor
7.b	Literature Review(Lire)	weight=1%-100%, progress =1%..100%	
7.c	Problem Analysys(ProbA)	weight=1%-100%, progress =1%..100%	
7.d	Designed Solution(Dsol)	weight=1%-100%, progress =1%..100%	
7.e	Developed Solution(Vsol)	weight=1%-100%, progress =1%..100%	
7.f	Analysis of Solution(Asol)	weight=1%-100%, progress =1%..100%	
7.g	Conclusion(Colu)	weight=1%-100%, progress =1%..100%	

Measuring levels of knowledge is based on mastery of the topics. Topics are classified into five types, FP artifact content, methods and tools that was required to complete the FP, non-technical aspects such as soft skills, FP administrative procedure, and academic rules. Each category is classified into the knowledge of WHAT and HOW. HOW Knowledge is more depth and detail than the WHAT. The number of topics may vary

and evolve, but were used as a reference to determine the levels of of knowledge is a percentage. Table 3 and 4 provides an illustration of how the classification and leveling of the knowledge was made. Examples of learning topic can be seen in Table 4.

Table 3 Leveling of Knowledge

Know ledge Level	CONDITION				
	FP's Artif	supported tools and method	Administr ation Procedure	Academic Rule	Non Technic Factor
1	10%		5%	5%	5%
2	20%		10%	10%	10%
3	30%	5%	15%	15%	20%
4	35%	10%	15%	15%	20%
5	30%	20%	15%	15%	20%

Table 4 Classification and Calculating Knowledge Level

classification	FP's Artifact	supported tools and method	Administrati on Procedure	Academic Rule	Non-technics factor	Total
What	X1	X2	X3	X4	X5	N1%
How	Y1	Y2	Y3	Y4	Y5	N2%
	30%	20%	15%	15%	20%	100%

Table 5 Example Subjects Of Knowledge about Final Project

Knowledge	Classification	
Journey of Final Project	Brief	
Structure of Final Project Report and Writing	Artifact	WHAT
Content of Proposal	Artifact	WHAT
Content of Literatur Studi	Artifact	WHAT
Content of System Analysis	Artifact	WHAT
Content of Desain Solution	Artifact	WHAT
Content of Develop Solution	Artifact	WHAT
Conten of quality analysis of solution	Artifact	WHAT
How to write Abstract	Artifact	HOW
How to extract FP's Report to Jurnal	Artifact	HOW
Lesson Learned about maintain communication with Supervisor	Non-Technics	HOW
How if I am in the dark	Non-Technics	HOW
How if I am stuck in programming problem	Tools & Method	HOW
How if My report always doesn't match with my supervisor's requirement	Tools & Method	HOW
How if I am stuck in statistik analysis problem	Tools & Method	
How if I am late for registration	Administration	HOW
How if I am in the 14 th semester (last semester)	Academic Rule	HOW
How if I want to graduate this semester	Administration	HOW
Procedure for registration	Administration	WHAT
Procedure for proposal review	Administration	WHAT

4.2 Access

Access is relation between the status of the activity, in which every action may be done if a combination of value-status meets certain conditions, and after the action is executed he will update one or more status to the specified value. Access then modeled as a name-precondition-postcondition.

```
ActionName(parameter)
PreConditon
        {Status= Value | Status =
            function(Value)}
PostCondition
            {Action( status,Value)}
```

Name of action is defined with specific name parameter. Table 6 described detail kind of action.

Table 6 Action list

Num	Activity	Parameter	Example
1	Registration	semester,date	registration(20122,"1/1/2013")
2	learn	topic	learn("content of proposal")
3	work	position	work("level1")
4	work-forfriend	position	work-forfriend(ID of friend)
5	apply	step of core activity, kind of services	apply(proposal, reguler)
6	scheduling	step of core activity, kind of services	scheduling(proposal, reguler)
7	done	step of core activity, kind of services	done(proposal,overschedule)
8	passed	step of core activity, kind of services	passed(proposal)
9	request-supervisor	name of supervisor	request("adi nugraha")
10	add-artifact	name of artifact	add-artifact(bibliografi)
11	set-artifact	name of artifact , progress value	set-artifact(proposal,100%)
12	add-artifact-content	name, title, number of refered	add-artifact-content(bibliografi, "xxx", 2)
13	Decrement	status, value	decrement(point, 200)
14	Increment	status, value	Increment(goldenticket, 1)

```
Apply(proposal,regular)
PreConditon
  Step.proposal=”none”
  Registration=”active”
  Knowledgelevel=”2”
  Artifac.bibl= greatherthan(30%)
PostCondition
  update(step.proposal,”submitted”)

Scheduling(proposal,reguler)
PreConditon
   Step.proposal=”submitted”
   Registration=”active”
   Knowledgelevel=”2”
   Artifac.bibl= greatherthan(30%)
PostCondition

update(step.proposal,”scheduled”)
```

```
Done (proposal,overschedule)
PreConditon
  Step.proposal=”scheduled”
  Registration=”active”
  Knowledge=”2”
  Artifac.bibl= greatherthan(30%)
  FreqSupervising = greatherthan(14%)
PostCondition
  update(step.proposal,”revised”)
  update(badge,”white”)


Passed(proposal)
PreConditon
  Step.proposal=”revised”
  Registration=”active”
  Knowledge=”2”
  Artifac.bibl= greatherthan(30%)
  FreqSupervising = greatherthan(14%)
PostCondition
       update(step.proposal,”accepted”)
       update(badge,”white”)
```

4.3 Power

In the proposed game design, there is only one type of activity that fall into the "power", which give points or golden ticket to the final project course participants that their registration status is active. For golden ticket transfer, the precondition is ticket giver has more than one. If the point are given, then the requirement is the number of point already owned more of the 500 and the transfer process must leave a minimum of 200 point for the giver.

```
Give("golden ticket",number, <ID of the friend>)

Give("point",number, <ID of the friend>)
```

4.4 Stuff

As mentioned in the previous paragraph that in this gamification, stuff is implemented as a "golden ticket". Furthermore golden ticket may be used to request special services, its kinds are (1) asking for guidanced by a certain lecturer (2) obtain administrative services even though the service has been closed (3) redcarpet service(first class services), no need to queue and all procedures to be carried out physically be assisted by the clerk.

```
Buy("goldenticket")
PreConditon
        Knowledge=greatherthan(2)
        Registration="active"
        Poin= greatherthan(500)
PostCondition
        Increment(goldenticket,1)
        Decrement(poin,500)
```

6 . System Use of Application S/W for Final Project Management Using Gamification

System Task of this gamification S/W application for Final Project management is described in use case diagram at figure 5. There are many task that is not mentioned in bussines use case of final project management but they can mapped to the bussines use case. Mapping analysis disecribed in tabel 7.

Figure 5 System Use Case

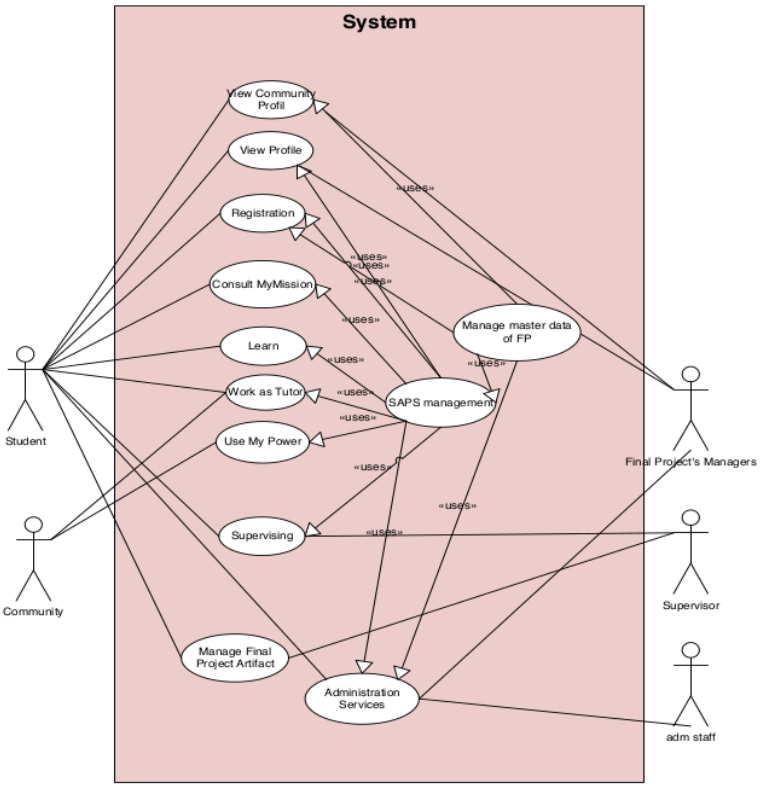

Table 7 Mapping of Current Bussines Use Case v.s System Use Case Using Gamification Concept

Bussines Use Case	System use case of Application Using Gamification Concept	Game Mechanic that can be implemented
Sosialization about Final Project content and Procedure and Research area	Learn	Cascading Information Theory ,Discovery
	Work As Tutor	Cascading Information Theory, EverQuest, Community Colaboration, and Virality
	Consult My Mission	Cascading Information Theory
Registration	Registration	
Assignment of supervisor	Administration Service Management , Manage Master Data of Final Project	Bonus
Proposal Review		
Seminar		
Sidang		
Completed Revision		
Supervising Pocess	Supervising	
-	View Profile	Status
-	View Community Profile	Virality, Community Colaboration
-	SAPS Management	
-	Use My Power	Virality, Community Colaboration
-	Manage Artifact of Final Project	Ownership

7 . CONCLUSION

MDA a conceptual model of the game defines that there are 3 elements of game design, those are the mechanic, dynamic, and aesthetic. In game design elements that be described in this paper did not include the aesthetic aspect. So to be implemented in real application still requires the development of the aesthetic element. SAPS only accommodate mechanic aspects. Dynamic aspects have been defined in the form of players journey from beginning to reach the goal, based on steps in the business process of final project

Collaboration between business processes with elements of game design is very interesting to further study. In this paper the business process final project can be combined harmoniously with the rule of the game. Seen from the business process sequence can still be maintained by playing pre-conditions and post-conditions. The socialization process can be implemented even better, because it ensures that every students be forced to understand the material.

Results from the real work of the one student working on his final project are represented well through final project artifact progress. Which is interesting to examine how the characteristics of systems and business processes are suitable to apply gamification? Or when viewed upside is there a certain system characteristics that indicate that gamification is not suitable to be applied.

Representation of the "access" that was designed in this paper was inspired by the principle of representation of action in the artificial intelligence by planning, namely PDA (precondition, delete, add). Each sub-sentence in it is expressed in the form of first order predicate calculus.

The difference is in the planning, post-conditions have only two actions, namely delete and add. While at this gamification, the majority of the post-condition is to update the status. However this needs to be studied further, as it will affect the suitability of the use of planning algorithms in searching the solution, especially when students access the menu about "consult my mission". In this menu, system must give intelligent mechanism

13 ACKNOWLEDGEMENTS

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8. Using Gamification In Design of Application

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